

# Olivia Walch

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<http://www-personal.umich.edu/~ojwalch>  
ojwalch@umich.edu | 703.328.0848

## EDUCATION

UNIVERSITY OF MICHIGAN  
Ph.D in Applied Mathematics  
September 2016 | Ann Arbor, MI

COLLEGE OF WILLIAM & MARY  
BS in Mathematics and Biophysics  
May 2011 | Williamsburg, VA

## MEETINGS

- Society for Neuroscience (2012 - 2014)
- Society for Research in Biological Rhythms (2014)
- Society for Mathematical Biology (2015)
- European Biological Rhythms/World Congress in Chronobiology (2015)
- Association for Research in Vision and Ophthalmology (2016)
- Society for Research in Biological Rhythms (2016)

## SOCIETIES

- Society for Industrial and Applied Mathematics, *President* (2011)
- Phi Beta Kappa, Alpha Chapter (2010)
- W&M Ukulele Club, *Founder* (2010)

## SIDE PROJECTS

- *Entrain*: Relates optimal lighting schedules for overcoming jet lag in least time. Since it was released in April 2014, the app has been downloaded over 165,000 times.
- *SketchAnything*: Teaches drawing step-by-step with low order Fourier series approximations of the lines in images (with Matt Jacobs)
- *OpticMobile*: Image warping and contrast enhancement for low-vision patients, to be used in conjunction with VR Headsets (with Matt Jacobs)
- *Squigglish (in development)*: Generates animations ("Squiggle-vision") from static drawings

## RESEARCH

MATHEMATICS OF SUBCONSCIOUS VISION | Ph.D Thesis & Postdoctoral work  
Jan 2014 – Present | Ann Arbor, MI

I study the mathematics of the subconscious visual system; in particular, the circadian clock. My PhD work, with advisors Dr. Daniel Forger and Dr. Kwoon Wong, focused on developing models of intrinsically photosensitive retinal ganglion cells (the cells in the retina that project to the circadian center of the brain). I also work on optimal control of the circadian clock, model identifiability using differential algebra approaches, and analyzing big datasets of human behavior collected through mobile applications.

TOPICS IN LINEAR ALGEBRA | Several research papers

Mar 2012 – May 2013 | Williamsburg, VA

Among the topics I worked on in linear algebra are commutativity of non-zero/zero matrix representations and the existence of a critical exponent for doubly nonnegative matrices.

## PUBLICATIONS

- Johnson, C. R., & Walch, O. J. "Critical exponents: old and new." *Electron. J. Linear Algebra* 25 (2012): 72-83.
- Johnson, C. R., & Walch, O. J. "Commuting pairs of patterns and symmetric realizations." *Electronic Journal of Linear Algebra* 25 (2012): 84-91.
- Lins, B., Walch, O. J., & Johnson, C. R. "A critical exponent for continuous conventional powers of doubly nonnegative matrices." *Linear Algebra and its Applications* 2010.435 (2011): 2175-2182.
- Johnson, C. R., Pisonero, M., Marijuan, C., & Walch, O. J. "Monomial inequalities in Newton polynomials." *J. Borcea Memorial* (2011).
- Vartanian, G. V., Li, B. Y., Chervenak, A. P., Walch, O. J., Pack, W., Ala-Laurila, P., & Wong, K. Y. Melatonin suppression by light in humans is more sensitive than previously reported. *Journal of biological rhythms*, 30(4) (2015): 351-354.
- Walch, O. J., Zhang, L. S., Reifler, A. N., Dolikian, M. E., Forger, D. B., & Wong, K. Y. Characterizing and modeling the intrinsic light response of rat ganglion-cell photoreceptors. *Journal of Neurophysiology*, 114(5) (2015): 2955-2966.
- Walch, O. J., Cochran, A., & Forger, D. B. (2016). A global quantification of "normal" sleep schedules using smartphone data. *Science Advances*, 2(5), e1501705.
- Walch, O. J., & Eisenberg, M. C. (2016). Parameter identifiability and identifiable combinations in generalized Hodgkin-Huxley models. *Neurocomputing*, 199, 137-143.

## AWARDS

- 2016 Co-winner of Peter Smereka Award for Best AIM Thesis (Ann Arbor, MI)
- 2016 First place winner, UMich "Mobile Apps Challenge" (Ann Arbor, MI)
- 2016 Second Place Overall Prize and Disney Prize Winner, MHacks (Ann Arbor, MI)
- 2015 First Overall Prize and Microsoft Prize Winner, HackNTU (Taipei, Taiwan)
- 2015 Grand Prize and Best Use of Wolfram Technology Winner, MHacks (Ann Arbor, MI)
- 2014 Top three finisher, Meeting of the Minds Hackathon
- 2012 National Science Foundation Graduate Fellowship Recipient
- 2011 Rhodes Scholar Finalist, Georgia/Virginia District
- 2011 "Young Scientist" Award for Ph.D students, MatTriad Conference
- 2011 W&M Mathematics Luther T. Conner Prize
- 2010 Co-Gold medalist, International University Physics Competition
- 2010 Named "America's Next Great Cartoonist" by the Washington Post
- 2007 William and Mary 1693 (Murray) Scholar, 1 of 5