

## Brent K. Young

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eRA COMMONS USER NAME: BRENTKYOUNG

POSITION TITLE: Postdoctoral research associate

### EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE (if applicable)	START DATE MM/YYYY	END DATE (or expected end date) MM/YYYY	FIELD OF STUDY
University of Utah, SLC UT	B.S.	08/2007	05/2013	Biology
University of Utah, SLC UT	Ph.D.	08/2013	12/2019	Neuroscience

### A. Personal Statement

To prepare to obtain a university faculty position in research of system level sensory processing and circuitry, I have performed independent research projects both during my undergraduate and graduate programs. During my undergraduate study I worked on an independent project under the supervision of my PI to determine if song like practice occurs during sleep using EMG recordings of the syrinx. I performed the surgeries required for the research, the data gathering, and the data analysis. The results of my experiment demonstrated that adult male zebra finches have song like activity in their vocal organ (the syrinx) during sleep without the corresponding respiratory patterns. These results are the only known occurrence of complex motor patterns during sleep in animals.

To further pursue my research goal, the focus of my PhD thesis research is to determine the presynaptic input of specific subtypes of retinal ganglion cells (RGCs), and how those circuits affect visual behavior. To accomplish my goals, I use RGC subtype specific transsynaptic gene expression for fluorescent tracers to identify the bipolar cell inputs to specific RGC subtypes. I have been able to utilize cutting edge transneuronal tracing techniques in my work. My work has led to the discovery of a cell class in the retina, and the identification of unique presynaptic circuitry. The results of my research will clarify both the fine anatomy of RGCs and their circuits. Additionally, I have trained numerous undergraduate students, helping them to start their own projects, get their research funded, and traveling to conferences.

### B. Positions and Honors

ACTIVITY/ OCCUPATION	START DATE (mm/yy)	END DATE (mm/yy)	FIELD	INSTITUTION/ COMPANY	SUPERVISOR/ EMPLOYER
Teaching assistant	08/11	05/13	Biology/Physiology	University of Utah	David Temme
Research assistant	08/11	05/13	Biology	University of Utah	Franz Goller
Lab Aide	08/12	02/13	Biology	University of Utah	Franz Goller
Predoc	08/13	12/19	Neuroscience	University of Utah	Ning Tian
Postdoc	1/20	Present	Neuroscience	University of Utah	Ning Tian

### Academic and Professional Honors

George and Delores S. Eccles Scholarship, University of Utah, 08/01/2007-05/01/2013

Undergraduate Research Opportunities Program fellowship, University of Utah, 08/01/2011-05/30/2012

Rio Mesa Fellowship, University of Utah, 06/01/2012-07/30/2012

B.S. awarded with honors, University of Utah, 05/01/2013

NIH Training Grant, T32 EY024234, 07/01/2014-06/30/2015, 07/01/2017-06/30/2018

Retina Research Foundation/Joseph M, and Eula C. Lawrence grant, ARVO Annual Meeting, 2016

### **Memberships in Professional Societies**

Member, Society for Neuroscience

Member, American Association for the Advancement of Science

Member, Association for Research in Vision and Ophthalmology

### **Committees and Leadership**

2013-2016 Member, Seminar Series Committee	Univ. of Utah Interdepartmental Neuroscience Program
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2016-2018 Co-Chair, Seminar Series Committee	Univ. of Utah Interdepartmental Neuroscience Program
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2014-2015 Co-Chair, Recruitment Committee	Univ. of Utah Interdepartmental Neuroscience Program
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2015-2018 Member, Recruitment Committee	Univ. of Utah Interdepartmental Neuroscience Program
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### **Journal Reviewer**

Vision Research

## **C. Contributions to Science**

1. Undergraduate Research: I spent two years working with Dr. Franz Goller at the University of Utah. My research centered on the activity of the vocal muscle, the syrinx, of song birds at night. My research revealed that the motor program for song during sleep diverges greatly from the structure during the daytime in both order and timing and does so without any audible vocalizations. This is the first recorded instance of complex motor pattern detection during sleep. However, it is likely that these motor patterns also occur in humans during sleep.

### **Abstracts**

Young, B.K., Goller F. (2012) Playback-induced syringeal motor rehearsal of song without concurrent respiratory movements. Society for Neuroscience Annual Meeting, 2012. Poster Presentation: 205.02, 2012-M-6876-SfN. Abstract.

### **Publications**

Young B.K. (2013). Syringeal motor rehearsal of song without concurrent respiratory movements, Honors Thesis, University of Utah.

Young, B.K., Mindlin, G.B., Arneodo, E., and Goller, F. (2017). Adult zebra finches rehearse highly variable song patterns during sleep. PeerJ 5, e4052.

2. Graduate Research: My predoctoral research under the guidance of Dr. Ning Tian at the University of Utah is focused on the form and circuitry of specific subtypes of retinal ganglion cells (RGCs). RGCs are the only source of information transfer from the eye into the brain. My project consists of three-dimensional mapping of the cells and their synaptic partners in the retina. Through this work I have been able to identify that alterations in RGC dendritic development caused by a knockout of the NMDA receptor subunit GRIN1 leads to the alteration in bipolar input of certain subtypes of retinal ganglion cells. I have also found that a member of the T-Cell receptor family, CD3 $\zeta$ , plays a role in regulating bipolar input to two different subtypes of retinal ganglion cells. Additionally, my work resulted in the discovery of a new and unique retinal cell class that expresses cell markers in common with both bipolar cells and amacrine cells. This cell, which we call a Campana cell, provides excitatory input in both the ON and OFF layers of the retina, and receives input from both rod and cone photoreceptors.

## **Abstracts**

Young B.K., Tian N. (2014) "Clearing up CLARITY," Society for Neuroscience Annual Meeting, 2014. Poster Presentation: 368.04, 2014-M-6658-SfN. Abstract.

Young B.K., Wang P., Diesseroth K., Tian N. (2016) "From the retina to the brain: retinal ganglion cell subtype specific visual circuits," Association for Research in Vision and Ophthalmology Annual Meeting, 2016. Poster Presentation: 285, 2760 - D0294. Abstract.

Brennan J., Young B.K., Tian N. (2016) "Virtual reality behavior testing for visual perception," Association for Research in Vision and Ophthalmology Annual Meeting, 2016. Poster Presentation: 285, 2764 - D0294. Abstract.

Young B.K., Ramakrishnan C., Wang P., Diesseroth K., Tian N. (2017). "A newly discovered, and unique subtype of BCs provides excitatory input to both ON and OFF synaptic pathways in the retina," Society for Neuroscience 2017, Poster Presentation: 683.12. Abstract.

Young B.K., Sanchez C.M., Ramakrishnan C., Wang P., Diesseroth K., Tian N. (2018). "NMDA receptor activity regulates synaptic connections between retinal ganglion and bipolar cells, Accepted for presentation," ARVO 2018, 1864 - C0168

## **Publications**

Young BK, Brennan JN, Wang P, Tian N (2018) Virtual reality method to analyze visual recognition in mice. PLOS ONE 13(5): e0196563.

Young BK, Ramakrishnan C, Ganjawala T, Wang P, Diesseroth K, Tian N (Under review, PNAS) A unique and evolutionarily conserved retinal interneuron relays rod and cone input to the inner plexiform layer. Pre-print available at BioRxiv. <https://www.biorxiv.org/content/10.1101/2020.05.16.100008v1>

Young BK, Sanchez M, Wang P, Tian N (In Prep) New cell class regulates prolonged ON responses in the retina.

Young BK, Sanchez M, Wang P, Tian N (In Prep) CD3ζ regulates synaptic connections between retinal ganglion and bipolar cells.