



CONNECTIONS

FALL 2017

Director's Corner

Neurons without connections are just a bunch of cells that cannot accomplish much. Just like their complex connectivity that provides the structural framework for the numerous functions that promote organismal survival, learning, and cognition, so too we hope that this newsletter, "**Connections**", will provide an architecture by which to enhance the mission of the Vanderbilt Brain Institute (VBI) and the ability of its neuroscience community to thrive.

Within these digital pages, you will find stories about neuroscience faculty, students and alumni, their challenges, advances and triumphs. Information about what Vanderbilt neuroscientists are currently doing, what we are planning, and what we aspire to achieve will all be part of the mix. We hope that you will enjoy learning a little bit more about your neuroscience colleagues.

We hope that you also will be willing to share stories of your own in future editions. As any system grows, maintaining communication becomes its biggest challenge. It is great to have

billions of neurons in our brain, requiring trillions of connections to work, but that is not enough: it takes circulating information to self-organize the network and give it meaning. This newsletter offers a new pathway for the VBI. With your help, let's all add function and make it meaningful!

Ronald Emeson, Ph.D.

Joel G. Hardman Professor of Pharmacology, Biochemistry, Molecular Physiology & Biophysics and Psychiatry & Behavioral Sciences
Interim Director, Vanderbilt Brain Institute



2017 Vanderbilt Brain Institute Retreat

by Shawn Barton, NSO Retreat Coordinator

This year's VBI retreat will be held on Tuesday, September 26th at Cheekwood Botanical Garden! Our keynote speaker will be Dr. Joshua Greene, Professor of Psychology at Harvard University. Dr. Greene's work has focused on the psychology and neuroscience of moral judgment and decision-making with a broader emphasis on studying the intersection of philosophy, psychology, and neuroscience. Registration is now closed. However, please call Beth Sims at 615-936-3705, and we can try to squeeze you in.

Announcing....Neuroscience Extravaganza

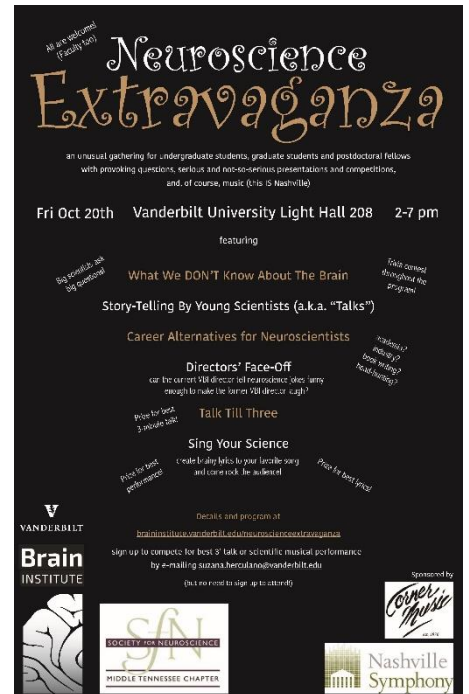
by Suzana Herculano, Ph.D.

On October 20, 2017, Vanderbilt will host to a one-of-a-kind neuroscience event, designed for undergraduate and graduate students and postdoctoral fellows (but faculty are welcome to attend too!). Come to the *Neuroscience Extravaganza* and listen to Profs. Ariel Deutch, David Sweatt and Isabel Gauthier explore what is NOT known in cellular, molecular and cognitive neuroscience; attend short talks by young scientists; ask career-related questions to neuroscientists in different occupations; compete for the best 3-minute talk; and, last but not least, put your own brain-related lyrics to your favorite song and come to the Sing Your Science session, closing the evening.

Prizes will be awarded for best short talk, best original lyrics and best performance.

Neuroscience Extravaganza! is proudly presented by the Middle Tennessee Chapter of the Society for Neuroscience in association with the Vanderbilt Brain Institute. To sign up your talk or song to compete, please e-mail:

suzana.herculano@vanderbilt.edu.



The poster for Neuroscience Extravaganza features a dark background with gold and white text. At the top, it says "All are welcome (Faculty too)" and "Neuroscience Extravaganza". Below that, it describes the event as "an unusual gathering for undergraduate students, graduate students and postdoctoral fellows with provoking questions, serbia and non-serious presentations and competitions, and, of course, music (this is Nashville)". The event is on "Fri Oct 20th" at "Vanderbilt University Light Hall 208" from "2-7 pm". It lists several activities: "What We DON'T Know About The Brain", "Story-Telling By Young Scientists (a.k.a. 'Talks')", "Career Alternatives for Neuroscientists", "Directors' Face-Off" (with a humorous question about directors), "Talk Till Three", and "Sing Your Science" (with a humorous question about lyrics). There are also humorous phrases like "It's possible... on the outside", "Talks carried throughout the program", "Admission? money? book? no! headbanging!", "Prize for best 3-minute talk", "Prize for best performance", and "Prize for best final". At the bottom, it says "Details and program at braininstitute.vanderbilt.edu/neuroscienceextravaganza" and "Sign up to compete for best 3' talk or scientific musical performance by e-mailing suzana.herculano@vanderbilt.edu". It also includes logos for "VANDERBILT Brain INSTITUTE", "SOCIETY FOR NEUROSCIENCE MIDDLE TENNESSEE CHAPTER", "Sponsored by Corey Roach", and "Nashville Symphony".

Student Awards!

Bianca Flores, graduate student in Dr. Eric Delpire's laboratory, won a travel award to present a poster at the International Society for Neurochemistry (ISN) and the European Society for Neurochemistry (ESN) meeting held in Paris, France. While in France, she also attended the Brain in Flux meeting in Maitenon, France, a satellite meeting of the ISN-ESN main meeting. Bianca gave a talk on her thesis work and won an additional travel award at the satellite meeting for research on cation chloride co-transporters and their association with peripheral neuropathy.

Rachael Muscatello, graduate student in Dr. Blythe Corbett's laboratory, has been named one of eight recipients of an Autism Speaks Weatherstone Pre-doctoral Fellowship Award. The study

will investigate dysregulation of the autonomic nervous system (ANS).

Corey Roach, graduate student in Dr. Anita Disney's laboratory, recently was named a 2017 Dennis R. Washington Achievement Scholar through the Horatio Alger Association. Endowed in 2008, Dennis R. Washington Achievement Graduate Scholarship provides financial assistance to State and National Horatio Alger Scholar Alumni who have exhibited leadership, integrity, entrepreneurial skills, and perseverance in overcoming personal adversity, and who aspire to pursue a graduate level education. The program awards scholarships annually to deserving National or State Horatio Alger Scholar Alumni who are working towards a post-graduate degree.

Xiaohan Wang, graduate student in Dr. Roger Colbran's laboratory, recently received the "Best Graduate Student Poster Presentation" award (an iPad) at the recent FASEB Science Research Conference on ion Channel Regulation, sponsored by *The Journal of General Physiology*. He was also invited to deliver a short talk on his project.





Alumni Spotlight



Dr. Emily Mason
graduated from Vanderbilt in 2016 with a Ph.D. in

neuroscience. She is currently working as a postdoctoral fellow at the University of Louisville in Louisville, KY. She is working with Dr. Joseph Neimat, a neurosurgeon who was also formerly at Vanderbilt. Dr. Neimat specializes in a surgery called Deep Brain Stimulation, or DBS. This surgery is used to relieve some of the symptoms associated with movement disorders such as Parkinson's Disease or Essential Tremor. During the surgery, electrodes are permanently implanted in a region of the brain known as the basal ganglia. These electrodes regulate brain activity, similar to how a pacemaker regulates the heart. To make sure that the electrode is placed in the exact right location, patients are kept awake during the surgery. They are asked to speak and move while electrical activity in their brain is being recorded. When surgeons believe the electrodes are in the right place, they turn them on and again have patients speak and move to make sure that they don't have any side effects from electrical stimulation, like slurred speech or tingling in their fingers.



Keeping a patient awake while there are electrodes in their brain is a huge benefit for neuroscience, because it provides neuroscientists with the rare opportunity to study the electrophysiology of a real, human brain while a person is awake and doing things. As part of Dr. Mason's work, she will be performing cognitive testing in patients during their surgeries. She will be able to listen to and record brain activity while the patient is doing these tests, and she will be able to use the electrodes to stimulate their brain and see how that affects the way they perform the cognitive tasks. Dr. Neimat, Dr. Mason, and their collaborators at Vanderbilt and elsewhere hope that this research will help with some of the side effects associated with DBS surgery, as well as increase our understanding of how the basal ganglia controls cognition.



Dr. Bradley Kraemer
graduated from Vanderbilt in 2014 with a Ph.D. in

neuroscience. He was hired to a tenure-track position as Assistant Professor of Biological Sciences at Eastern Kentucky University in August of last year. Over the past year, he has taught several courses related to cell biology, as well as established an active research laboratory equipped to investigate molecular mechanisms of neurodegeneration. This summer his department recently moved to a newly constructed, \$66 million science building, and he has been excited to set up his lab in a well-designed and modern facility. He recently was awarded an extramural grant to investigate the signaling mechanisms through which the p75 neurotrophin receptor promotes neurodegeneration in the central nervous system, and his laboratory is investigating the effects of the longevity hormone klotho on hippocampal astrocyte function. He is currently mentoring two undergraduate students and one graduate student. In addition to guiding these research projects, he will also teach a

new neurobiology course for undergraduate and graduate students that he is introducing to the department this fall.

Upcoming Events

**FIRST ANNUAL
Vanderbilt Center
for Addiction
Research
SCIENCE DAY**

Save The Date
10.17.2017
Belcourt Theater

Dr. Stephen Loyd
Medical Director for the Division of Substance Abuse Services
TM Department of Mental Health & Substance Abuse Services

Dr. Brigitte Kieffer
Scientific Director, Douglas Institute
Professor, Department of Psychiatry, McGill University
Chair, Montreal Neurological Institute

Dr. Erin Callpuri
Assistant Professor, Department of Pharmacology
Vanderbilt Center for Addiction Research
Vanderbilt University School of Medicine

Dr. Carrie Jones
Assistant Professor, Department of Pharmacology
Vanderbilt Center for Addiction Research
Vanderbilt University School of Medicine

Vanderbilt Center for Addiction Research

Brain INSTITUTE

SEMINARS IN NEUROSCIENCE: BRAIN, MIND, AND SOCIETY
2017 FALL SCHEDULE

WEDNESDAY, SEPTEMBER 6, 2017 Christina Zhao, Ph.D. Postdoctoral Research Assistant, University of Washington Co-sponsored with The Program for Mind, Mind & Society at Vanderbilt	WEDNESDAY, OCTOBER 18, 2017 Diego A. Pizzagalli, Ph.D. Professor of Psychiatry, Harvard Medical School/Boston Children's Hospital Co-sponsored with The Vanderbilt Kennedy Center
WEDNESDAY, SEPTEMBER 20, 2017 Forum/Nano-Symposium Katherine Abouid, Jean-Paul Noel & Robin Shuler	WEDNESDAY, OCTOBER 25, 2017 Forum/Nano-Symposium Melissa Cooper, Sull Kim & Joe Luchsinger
WEDNESDAY, SEPTEMBER 27, 2017 Alex Huk, Ph.D. Professor, Departments of Neuroscience & Psychology, The University of Pennsylvania Co-sponsored with The Vanderbilt Vision Research Center	WEDNESDAY, NOVEMBER 1, 2017 Seminar TBA Co-sponsored with Molecular Physiology & Biophysics
WEDNESDAY, OCTOBER 4, 2017 Forum/Nano-Symposium Rajwani Nijim & Nick Smith	WEDNESDAY, NOVEMBER 8, 2017 Shwetal Mehta, Ph.D. Assistant Professor of Neurobiology, Rancho Neurological Institute
WEDNESDAY, OCTOBER 11, 2017 Zhigang He, Ph.D. Professor of Neurology, Harvard University	WEDNESDAY, DECEMBER 6, 2017 Seminar TBA Co-sponsored with Molecular Physiology & Biophysics

4:10 PM
1220 Medical Research Building III

For more information, contact Beth Sims at 615-926-7095 or braininstitute@vanderbilt.edu



Outreach

by Shilpy Dixit, Ph.D.

Every summer, the **Vanderbilt Summer Academy** gives gifted middle and high school students the opportunity to engage in STEM development as part of Programs for Talented Youth. Dr. Fiona Harrison and her lab hosted 13 students in the Alzheimer's Treatments and Research module for an intensive



research day focused on the use of mouse models in Alzheimer's research. In this module, students gain a greater understanding of Alzheimer's disease and its treatments, so the goal of this lab day was to reinforce what they have learned through immersion in scientific research. The students gained hands-on experience extracting DNA from mouse tails and genotyping the APP/PSEN1 mouse model of Alzheimer's disease. They also dissected mouse brains, sliced and mounted frozen brain sections using a microtome and observed mouse behavioral tasks, such as the Morris water maze and nest building. This was a fantastic opportunity for the students to learn more about careers in research and career opportunities after attending University since they were able to talk in depth with lab personnel, including undergraduates, medical students, graduate students, and faculty. It was also a rewarding and enjoyable experience for lab members who had to answer an impressive array of questions. "Engaging with young scientists in this personalized and directed program was as motivating for us as for them, and well-worth the time investment", said Dr. Harrison, "the

biggest challenge was finding 6 sets of functioning pipettes without tapping into our good ones."

Jacob Ruden (Dugan Lab) and **Shilpy Dixit** (Harrison lab) have partnered with the Nashville Public Libraries to develop a public lecture series entitled "Alzheimer's Disease and Dementia- Get the Facts". This community outreach project originated from a request from Donelson Branch Library programming and quickly sparked the interest of other branches around Nashville. The goal for this series is to provide an opportunity for interested members of the public to have an open discussion about Alzheimer's disease from symptoms and stages and caregiver support and strategies to current research in diagnosis and treatment.



Lectures currently scheduled:

- Goodlettsville Branch on Saturday, October 7 at 10:30am
- Bellevue Branch on Saturday, October 28th at 10:30am
- Green Hills Branch on Wednesday, November 1st at 1:00pm



**METRO
NASHVILLE
PUBLIC
SCHOOLS**

Outreach opportunity: Guest Lecturers on Neuro- science Sought for Nashville Public Schools

If you've just been waiting for an opportunity to impress young minds about how cool it is to do science, here it is: in partnership with the VBI, the Center for Science Outreach at Vanderbilt is seeking guest lecturers to visit high school and middle school science classrooms in Nashville during fall 2017.

Each visit lasts one hour in the classroom, during which the guest lecturer is invited to talk about not only their favorite research topic, but also what it is like to be a scientist – what your day is like, and how your life is more than just wearing a white lab coat and saying serious stuff. The goal of the visits is to raise awareness about science and draw interest from the next generation, particularly from kids from underrepresented backgrounds. These visits are typically fun, and also help scientists look at their own work in a whole different way. Each scientist can act as guest lecturer just once or sign up to visit multiple classrooms.

All are welcome to participate: graduate students, postdoctoral fellows and faculty. Classroom visits are sought as early as the week of September 12 through to the first week of December. If you'd like to participate, please contact: suzana.herculano@vanderbilt.edu.



BP Endure

by Roz Johnson

The BP-ENDURE program connects research-intensive institutions to institutions that have substantial enrollments of neuroscience majors from traditionally underrepresented groups. The current programs that interface with Vanderbilt include consortiums from: New York (Hunter College and NYU), Georgia (Agnes Scott College, Spelman College, Emory University and Georgia State University), Texas (University of Texas Health Science Center) and Washington University. The program supports a range of activities to increase undergraduate student's interest in the neurosciences, including research experiences, curriculum development, seminars, journal clubs and poster presentation. For summer 2017 the program had three interns to come to Vanderbilt. They worked in the labs of Prof. Jennifer Blackford, Prof. Aaron Bowman and Dr. Michael Cooper.

Select Recent Publications of the VBI

Kim H-W, Kim C-Y, Blake R (2017) Monocular perceptual deprivation from interocular suppression temporarily imbalances ocular dominance. *Curr Biol* 27, 884-889.

Link:

<http://www.sciencedirect.com/science/article/pii/S0960982217301276?via%3Dihub>

Davis JK, Broadie K (2017) Multifarious functions of the fragile X mental retardation protein. *Trends Gen*, in press.

Link:

<http://www.sciencedirect.com/science/article/pii/S0168952517301257?via%3Dihub>

Catania KC (2017) Electrical potential of leaping eels. *Brain Behav Evol* 89, 262-273.

Link: <https://www.karger.com/Article/FullText/475743>

Tavalin SJ, Colbran RJ (2017) CaMKII-mediated phosphorylation of GluN2B regulates recombinant NMDA receptor currents in a chloride-dependent manner. *Mol Cell Nsci* 79, 45-52.

Link:

<http://www.sciencedirect.com/science/article/pii/S1044743116302718?via%3Dihub>

Price GR, Yeo DJ, Wilkey ED, Cutting LE (2017) Prospective relations between resting-state connectivity of parietal subdivisions and arithmetic competence. *Dev Cogn Nsci*, in press.

Link:

<http://www.sciencedirect.com/science/article/pii/S1878929316301529?via%3Dihub>

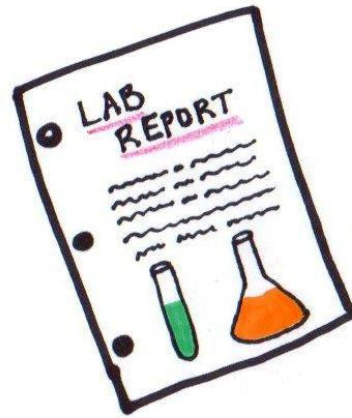
Stamm S, Gruber SB, Rabchevsky AG, Emeson RB (2017) The activity of the serotonin receptor 2C is regulated by alternative splicing. *Hum Gen*, in press.

Link: <https://link.springer.com/article/10.1007%2F500439-017-1826-3>

Richler JJ, Wilmer JB, Gauthier I (2017) General object recognition is specific: Evidence from novel and familiar objects. *Cogn* 166, 42-55.

Link:

<http://www.sciencedirect.com/science/article/pii/S0010027717301361>



Walker JM, Dixit S, Saulsberry AC, May JM, Harrison FE (2017) Reversal of high fat diet-induced obesity improves glucose tolerance, inflammatory response, beta-amyloid accumulation and cognitive decline in

the APP/PSEN1 mouse model of Alzheimer's disease. *Neurobiol Disease* 100, 87-98.

Link:

<http://www.sciencedirect.com/science/article/pii/S096999611730013X?via%3Dihub>

Bluett RJ, Bladi R, Patel S (2017) Endocannabinoid signaling modulates susceptibility to traumatic stress exposure. *Nature Comm* 8, 14782.

Link:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5379055/#!po=0.769231>

Simon DM, Noel J-P, Wallace MT (2017) Event related potentials index rapid recalibration to audiovisual temporal asynchrony. *Front Integr Neurosci* 11, 8.

Link:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5360737/>

Reinhart RMG, Cosman JD, Woodman GF (2017) Using transcranial direct-current stimulation (tDCS) to understand cognitive processing. *Atten Percep Psychophys* 79, 3-23.

Link:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5539401/#!po=0.641026>

Choisdealbha AN, Piech RM, Zald DH (2017) Reaching back: the relative strength of the retroactive emotional attentional blink. *Sci Rep* 7, 43645.

Link:

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5334653/#!po=1.38889>

Numerical cognition research at Vanderbilt

by Iliza Butera

If you were asked to describe a bowl of apples, you might mention characteristics like color, shape, or weight. And you'd probably notice the fact that there are, say, five apples in the bowl. As Neuroscience Ph.D. student Eric Wilkey explains, "the numerical magnitude or the 'fiveness' of a group of objects is an important characteristic that the brains of many different animals—from fish to birds to primates—seem to process in similar ways."

In a new study, Wilkey and his mentor, Gavin Price, Ph.D., studied the brains of dozens of high schoolers along with their PSAT math scores to see what the judgement of quantity could tell us about mathematical proficiency.

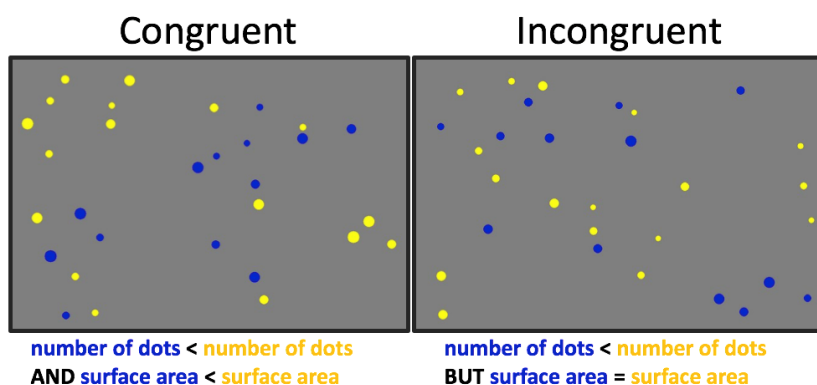
In what's called a nonsymbolic number comparison task, they asked high schoolers to lay in an MR scanner and look at groups of dots on a screen. The task was simple: do you see more yellow or blue dots? But there's a catch: by also manipulating the surface area of the dots, Wilkey and his colleagues sometimes made it more difficult to tell which dots had a larger magnitude.

"Typically, a greater quantity of objects will also take up more space. In other words, surface area is an important nonnumeric visual cue that we use to make the judgment of magnitude," says Wilkey. On these so-called "incongruent trials," students had to judge quantity regardless of

dot size, which took them longer to respond. Although accuracy on both congruent and incongruent trials correlated with math proficiency, fMRI results showed distinct patterns for these two visual conditions.

Prior work had identified that the intraparietal sulcus—which divides the superior and inferior parietal lobules of the brain—underlies the judgment of quantity. These current findings, published in the journal *NeuroImage*, indicate that additional brain regions are engaged when visual characteristics are manipulated. "They may be more associated with higher cognitive processes than simply magnitude processing," says Wilkey. More recent work suggests that people with math learning disabilities may struggle more with the incongruent trials of the comparison task. Based on these new findings, diagnostic tools for math learning disability and early interventions might use visual congruency to better probe the cognitive systems that underlie math skills.

So, no matter where you are in the food chain, the perception of quantity is an important skill to master. Whether you're a lion planning a territorial attack or a squirrel looking for a tree with the most nuts, numerical magnitude drives many animal behaviors, including acing that math test.



Both images above have more yellow dots than blue dots, but students were faster and more accurate when the total surface area was congruent with the magnitude (left). Recent studies show that visual congruency is an important factor for how this commonly-used task relates to math skills.

NGP has eight new students in 2017 (NGP Overview)

by Bruce Carter, Ph.D.

The Neuroscience Graduate Program at Vanderbilt is the largest graduate program on campus, currently hosting 85 students and 95 training faculty that span across 22 departments in 5 schools. The research covers a wide range of neuroscience, from purely basic to directly translational and clinical. This year we are excited to have 8 new students, 3 that matriculated directly into the program, 3 that came from the Interdisciplinary Graduate Program and 2 that joined from the Medical Science Training Program (the MD/PhD program). We also celebrated 11 of our students successfully defending their dissertations and receiving their PhDs. As the new academic year begins, we look forward to our Annual Retreat, where we officially recognize our new students in front of everyone in the program, and we are excited to begin a new recruiting season!

NGP's mission is to provide an exceptional academic and research training environment designed to prepare our graduating students to become future leaders in the neuroscience community. Toward that end, our students are required to take two rigorous courses that cover the fundamentals of neuroscience, from molecules to mind; a class on the neurobiology of disease; and a course in grant writing. Students can also take elective courses within our program or in any program across campus. Our students are also provided teaching experience through serving as a teaching assistant for one semester in a neuroscience class of their choice. After two years of course work and gaining some research experience, students must take a Qualifying Exam, which has both a written and oral component and is administered by their Dissertation Committee. Upon passing the exam, a student is officially a doctoral candidate and will spend their remaining time focused on their thesis research, culminating with a public seminar in front of their Dissertation Committee. After successfully defending their work, the student is granted a Doctor of Philosophy (Ph.D.), the highest academic degree awarded by a university.



Justin Avila, IGP
Southard-Smith Lab



Elizabeth Hale, MSTP
Blackford Lab



Jordyn Wilcox, IGP
Bowman Lab



Kellie Wilson, IGP
Winder Lab



Jennifer Quinde, Direct Admit
FISK-Vanderbilt Bridge Program



Bridget Collins, MSTP
Sweatt Lab



Alisa Zoltowski, Direct Admit
U. Michigan, Ann Arbor



Jane Burton, Direct Admit
St. Olaf College

2017 White Coat Ceremony

