Below are seven faculty proposals submitted for Summer 2017. Read each one and choose two projects that interest you the most.
Women in Science Enabling Research  
Faculty Research Proposal

Faculty Name and Department: Amy Bohnert, Ph.D.; Psychology Department

Project Titles: 1) Space to Grow Health and Wellness Evaluation, 2) Summertime Programming and Youth Well-Being Project

1) Please provide a short discussion of your research agenda and goals for the Summer of 2017.

**Space to Grow Health and Wellness Evaluation**

Space to Grow (STG) is an ongoing project that transforms broken-down and underutilized schoolyards of selected Chicago Public Schools (CPS) into new, vibrant green spaces that meet the unique needs and visions of their respective schools and communities. Research linking green schoolyards with improved health and wellness outcomes (e.g., improved nutrition, increased physical activity, decreased obesity rates and improved learning readiness/test scores) is still in its infancy. The 2016-17 Health and Wellness Evaluation of STG will inform green space literature in new and unprecedented ways by examining the impact of these schoolyard transformations on 1) utilization and characteristics of the schoolyard, 2) changes in students’ health, wellbeing, and academic outcomes, 3) changes in the school environment, and 4) changes in school-community engagement and cohesion.

During the summer of 2017, we will carry out these objectives by collecting on-site observational data collection via Behavioral Mapping and survey data collection. We will visit two schools who have not yet undergone schoolyard transformation, and will collect observational data on the current state of the schoolyard, schoolyard use at various times of day (before school, during school, after school, and on the weekend). We will also survey parents, staff, and community members to assess their perceptions of the schoolyard, school, and surrounding neighborhood/community. Additionally, we will visit three schools that have already undergone schoolyard redesign and will evaluate the maintenance of effects via schoolyard observation and surveying parents, staff, and community members.

**Summertime Programming and Youth Well-Being Project**

Summer increases in the amount of time that youth spend unsupervised or with peers, which implicates summer as a high-risk time to engage in problem behaviors. Despite knowledge that afterschool programs, extracurriculars, and other types of organized activities during the school year are beneficial for youth, few studies have examined the protective role that summer programs have on development. Without further examination, it is unclear how time spent during the summer translates to similar behavioral outcomes and psychological well-being.

The goal of this project is to examine how time spent in summertime programming relates to problem behaviors and positive youth development among a diverse sample of youth (aged 11-15). Across the summer months and into the school year, online surveys will be sent to parents and youth enrolled in select Chicago Park District programs. Beyond the amount and types of programming attended, other risk and protective factors will be collected including capacity for self-control, parental monitoring strategies, behaviors of peers, and time spent in other health-related activities. The results of this study will add to the general knowledge regarding the behaviors of youth within an understudied context, and provide valuable information to inform policy regarding summertime.

2) In what capacity will the student participate in your project? What tasks might the student be expected to complete and what skills might be required of the student?

An undergraduate student would be a valued member of our research team. Our research team will be leading both projects (Space to Grow (STG) Health and Wellness Evaluation and the Summertime Programming and Youth Well-Being Project). During May and June of 2017, students will be involved in organizing relevant materials, participating in data collection training sessions, recruiting participants, and collecting data. A didactic experience will also be offered involving reading and assessing relevant literature throughout the summer so that the student can develop a strong theoretical and empirical foundation to these specific research areas, and develop an area of inquiry within either dataset. It is our hope that the student would stay involved with in our Activity Matters lab during the 2017-18 academic year to assist with data coding, analyzing data related to their own research questions, as well as preparing abstracts for conferences as part of dissemination of research findings. We expect that undergraduate research assistants who work with our research team will demonstrate a high level of critical inquiry, professionalism, punctuality, and attention to detail.
3) Provide a short paragraph including both personal and professional biographical information.

I have been a full-time faculty member at Loyola University Chicago Psychology Department (clinical & developmental psychology) since 2003. Over the past fourteen years, I have relished the opportunity to mentor and work with numerous Loyola undergraduate students in both the classroom and laboratory settings. I direct the Activity Matters Lab (www.activitymatters.org) which offers an enriching, inter-disciplinary research environment that promotes scientific literacy, curiosity, and independent mentored inquiry. I provide a supportive and stimulating environment, and encourage my students to present their work at national conferences as well as publish. When I am not working, I love spending time with my husband and kids, exercising in almost any form, cooking, entertaining friends, and exploring both within and beyond the Chicagoland area.
Faculty Name and Department:
Dan Cavanaugh
Department of Biology

Project Title: Neuronal Control of Circadian Rhythms

1) Please provide a short discussion of your research agenda and goals for the Summer of 2017.
Most organisms have an internal circadian clock which produces daily rhythms in behavioral and
physiological processes, thereby allowing them to anticipate and adapt to the daily environmental cycles
produced by the rotation of the earth on its axis. My lab uses the powerful model organism of the fruit fly,
*Drosophila melanogaster*, to understand the neurobiological basis of circadian rhythms. We take a
multifaceted approach, combining state-of-the-art genetic, neuroanatomical, and behavioral techniques, to
identify genes, molecules, and neuronal circuits that allow the circadian clock to control diverse
physiological and behavioral outputs such as locomotor activity, sleep and feeding. We are also
investigating the role of the circadian system in controlling the response of the fly to various environmental
stressors.

2) In what capacity will the student participate in your project? What tasks might the student
be expected to complete and what skills might be required of the student?
The student would directly contribute to one of several ongoing research projects in the lab. She would join
a team of 1-2 other undergraduate students who are conducting ongoing research projects and would be
involved in day-to-day activities such as 1) fly maintenance and husbandry, 2) behavioral analysis of
locomotor activity rhythms using our automated activity monitoring system, 3) brain dissection and
immunohistochemistry to visualize protein expression and neuronal connectivity in the brain, 4) using
molecular biological techniques such as PCR, restriction enzyme digest and bacterial transfection to create
DNA constructs that will be used to generate novel lines of transgenic flies.

3) Provide a short paragraph including both personal and professional biographical information.
I received a Ph.D. in Neuroscience from the University of California, San Francisco and did postdoctoral
research in the Sehgal Lab at the University of Pennsylvania. I joined Loyola’s faculty in August 2015 and
teach classes for the new Neuroscience major. There are currently 9 undergraduates conducting research in
my lab and they are a friendly and welcoming bunch. I have a wife and ~2 yr-old daughter who currently
takes up most of my free time.
Faculty Name and Department: Prof. Reuben Keller, Institute of Environmental Sustainability.

Project Title: Field and lab work to determine the identity and distribution of invasive species in the Chicago River and Lake Michigan harbors.

1) Please provide a short discussion of your research agenda and goals for the Summer of 2017.
   My lab is focused primarily on the spread and impacts of invasive aquatic species. During summer 2017 we will be sampling throughout the Chicago area for non-native crayfishes, mollusks, and aquatic plants. Sampling sites will include the Chicago River and Lake Michigan harbors. Samples will be returned to the lab so that we can identify species, and all data will be entered into a GIS database so that we can map the current distribution of non-native species.

2) In what capacity will the student participate in your project? What tasks might the student be expected to complete and what skills might be required of the student?
   The student would have opportunities to be involved in field and lab work, and in data entry and data analysis. Field days can be long and occasionally physically demanding, and the student would need to be prepared to work hard as part of a team and to be punctual. We often use a boat to access lakes and rivers. Lab work may involve microscopes for sample sorting and identification. If the student is interested in data entry and analysis then I would be happy to work with them to develop the appropriate skills. In all work it is essential that the student take great care with our research process, in particular labeling all samples in a standard way.

3) Provide a short paragraph including both personal and professional biographical information.
   I have been at Loyola University Chicago for over five years. Prior to that I held post-doctoral positions at the University of Chicago and University of Notre Dame, and I completed his PhD at the University of Notre Dame. My main research interests are in the arrival, spread, and impacts, of invasive species. In particular, I try to conduct research that answers questions of direct relevance to managers and policy-makers. For example, the work proposed for this fellowship is being conducted with support from the Illinois Department of Natural Resources who plan to use our results to set up their own sampling schemes for non-native aquatic species.
   I grew up in Australia and became interested in freshwater and marine ecosystems there. I decided to come to the US for my PhD, and while at Notre Dame I met my wife, who is American. We decided to stay here in the US and we now live in Evanston and have a seven year-old daughter and five year-old son.
Women in Science Enabling Research
Faculty Research Proposal
Faculty Name and Department: John Kelly, Department of Biology
Project Title: Identifying sources of microplastic pollution in Lake Michigan tributaries

1) Please provide a short discussion of your research agenda and goals for the Summer of 2017.

Nearly 200 million metric tons of plastic are produced globally each year, and it is estimated that 10% of this plastic enters aquatic habitats. Microplastic particles (<5mm in diameter) are an environmental contaminant of emerging concern, as recent studies have shown high microplastic concentrations in oceans worldwide. Sources of microplastic include fragmentation of larger plastic pieces, industrial manufacturing pellets, personal care products and domestic cleansers (which can contain microplastic beads), and synthetic textiles (e.g., acrylic and polyester fibers). Several recent papers from our research team showed that microplastic particles were abundant in the Chicago River and in suburban Illinois rivers and a publication by our colleague reported high plastic concentrations in Lake Michigan. We are currently conducting a large scale field project to identify the major sources of microplastic pollution in Lake Michigan. In summer 2017 we will measure microplastic concentrations in 8 of the major tributaries of Lake Michigan (the Fox/Wolf, Grand, Kalamazoo, St. Joseph, Muskegon, Manistee, Menominee, and Milwaukee rivers). Our goals will be to 1) quantify and characterize microplastic inputs to Lake Michigan from its eight major tributaries, 2) assess the impacts of watershed land use on microplastic inputs from the tributaries, and 3) characterize microplastic interactions with biota in the tributaries, includes fish, invertebrates, and microorganisms.

2) In what capacity will the student participate in your project? What tasks might the student be expected to complete and what skills might be required of the student?

The student will participate in field work to collect samples from these tributaries and in laboratory analyses of the samples that are collected. Specifically, microplastic will be isolated from organic debris and animal tissues by chemical digestion and counted under the microscope. Microplastic composition will be characterized via Fourier Transform Infrared Spectroscopy (FTIR). Bacterial communities attached to the plastic will be analyzed using high-throughput sequencing of 16S rRNA genes and advanced bioinformatics analysis.

3) Provide a short paragraph including both personal and professional biographical information.

I obtained my B.S. degree in Biology from Dartmouth College in Hanover, NH, and my M.S. and Ph.D. degrees in Environmental Microbiology from Rutgers University. I worked at Northwestern as a post-doctoral fellow for three years, and I joined Loyola as a faculty member in the Biology Department in 2001. Here at Loyola I teach General Biology (BIOL 101) and General Microbiology (BIOL 302), and I have an active research lab that currently includes one postdoctoral fellow, one graduate student and four undergraduate students. My research generally focuses on the impacts of human activities on the structure and function of bacterial communities in the environment, with a focus on aquatic habitats. You can find more information about my work on my lab website (http://kellymicroecolab1.wix.com/kelly). I live in the city of Chicago in the Andersonville neighborhood, which is just a few miles south and west of Loyola. I live with my wife Eva, my 8 year old son Liam, and our dog Logan. My family enjoys many of the things that Chicago has to offer, including the beach, the museums (the Shedd Aquarium is Liam’s favorite), attending sporting events (Liam loves baseball, especially the Cubs) and the theater (Liam recently enjoyed Goldilocks and the Three Bears done by the Emerald City Theatre Company).

References:
1 http://pubs.acs.org/doi/abs/10.1021/es503610r
Faculty Name and Department:

Robert G. Morrison  
Psychology  

Project Title:

1) Please provide a short discussion of your research agenda and goals for the Summer of 2017.

Older adults have become the fastest growing segment of the US population with 70 million American's likely to be over 65 years of age by 2030. As life expectancies increase, so do the number of age related diseases including those affecting the human mind, such as Alzheimer’s disease. While decline in memory function is typical in old age, a notable characteristic of these data is a marked increase in variability across people. The poorest performers (amnestic mild cognitive impairment) are at high risk for developing Alzheimer’s disease. Conversely those at the high end of the distribution (super-agers) typically navigate their 80’s very successfully. While more average performers frequently experience steep cognitive decline during this decade of life.

We have previously collected scalp electroencephalograms (EEG) from a large number of younger and older adults in order to understand the differences in brain connectivity that related to successful and pathologic aging. We are currently analyzing these data using a variety of different computer-based techniques. We will continue this analysis this summer with the goal of preparing our results for presentation at the Cognitive Neuroscience Society Annual Meeting and for publication.

A central goal of the larger project is to develop inexpensive screening measures that could be used for monitoring the neurocognitive status of older adults. Of all current neuroimaging methods EEG offers the best opportunity for population level monitoring because it is noninvasive and relatively inexpensive because of recent developments in consumer level hardware. Ultimately the methods developed in this proposal could be useful for evaluating home brain training protocols intended to help people with either impaired or age-typical memory improve their cognitive reserves and thus lower their risk of being incapacitated by Alzheimer’s disease.

2) In what capacity will the student participate in your project? What tasks might the student be expected to complete and what skills might be required of the student?

Our WISER student will be working with Dr. Morrison as well as several other students in the lab to analyze EEG data using BESA and Matlab. The student should be interested in understanding the brain and cognition and developing basic data analysis skills. Enjoying working with computers is important. Having prior experience with Microsoft Excel, SPSS, or computer programming is a plus.

3) Provide a short paragraph including both personal and professional biographical information.

Robert G. Morrison, PhD, Associate Professor of Psychology and Neuroscience, uses behavioral, computational, and neuroimaging methods to investigate memory and reasoning throughout the lifespan. He has published numerous scientific articles and chapters, edited books for Cambridge and Oxford University Press and received a number of grants for his research. Dr. Morrison enjoys his time in the classroom and lab where he has taught and mentored many talented students who have gone onto exciting careers in science. He received the Edwin T. and Vivijeannie F. Sujack Award for Teaching Excellence in 2013 and the Langerbeck Award for Undergraduate Research Mentoring in 2012 and became the Undergraduate Program Director for the Department of Psychology in 2016.

Dr. Morrison lives with his wife and step-children (11 and 13) in the South Loop. Bob was initially attracted to cognitive science while he was a full time artist and continues to love to take photographs and occasionally exhibits his work. He’s also a huge music fan and audio geek thanks to his dad. He has also a yogi, which he enjoys practicing every day.

You can learn more about Dr. Morrison and the Cognitive & Affective Neuroscience lab by visiting here canlab.org.
Faculty Name and Department: Catherine Putonti, Departments of Biology & Computer Science

Project Title: The ‘Good’ Viruses

1) Please provide a short discussion of your research agenda and goals for the Summer of 2017.

The most abundant species on earth are viruses. While most people are familiar with the flu virus and the recent outbreak of the Zika virus, viruses which infect eukaryotes (humans, plants, and animals) are but a minority of the viruses on earth. Viruses which infect bacteria (bacteriophage) are the most abundant. These viruses play a pivotal role in all aspects of life on earth; they are important in nutrient cycling and also drive diversity and evolution within bacterial communities. Despite their importance, we have a very limited understanding of the biological diversity of bacteriophages (not to mention what they do). Our recent work, in collaboration with researchers at Loyola’s Health Sciences Campus, has been looking at the bacteriophages that call us home – members of the human microbiome. The human microbiome is the complex communities of bacteria and viruses that inhabit the niches of the human body, e.g. gut, mouth, eye, nose, etc. In particular, we’ve been looking at the viruses which live in the bladder.

Summer students will isolate and characterize viruses from the bladder microbiome. We have thousands of samples and each sample likely contains a multitude of viruses. We’ve yet to find a sample without viruses! With each discovery we gain insight into the largely uncharacterized microbiome of the bladder.

2) In what capacity will the student participate in your project? What tasks might the student be expected to complete and what skills might be required of the student?

The student will take one of our samples and lead the investigation of the viruses in that sample. This includes culturing the virus, isolating the virus, and characterizing the virus. Characterization includes taking pictures of it (using the transmission electron microscope), determining its generation time and how many progeny each virus produces in a generation, and lastly its genomic sequence. Perhaps the best part of discovering a new virus is the fact that you, the discoverer, get to name the virus. We’ve had Moody, Nemo, Wrath, Kracken, Envy, and many more.

You’ll be working as part of a team. Many students in my lab work on identifying and characterizing new phages… and our phages are part of the family! While no prior skills are required, it’s important that a student researcher have curiosity, patience, and good organizational skills.

3) Provide a short paragraph including both personal and professional biographical information.

I have a PhD in Computer Science and a Masters in Biology, both from the University of Houston. I joined Loyola’s faculty in fall 2007. I’m in the Biology and Computer Science Departments at Loyola and director of the Bioinformatics Program. I’ve always been fascinated by viruses and pathogenic species and as such, my lab’s research has focused on exploring new species in new niches of the world. In parallel to our work in the bladder microbiota, we also study the viruses which live in Lake Michigan. My lab includes both students with a biological background, those who like to pipette and grow organisms, and a computational background, those who prefer to study biological data. In my free time, I like to travel from national parks to foreign countries. It’s always fun to explore new places!
Faculty Name and Department: Wei-Ming Yu, Department of Biology

Project Title: Genetic Dissection of the auditory brainstem circuit

1) Please provide a short discussion of your research agenda and goals for the Summer of 2017.

Though it is estimated that 2 to 3% of all children have central auditory processing disorders (CAPDs), little is known about hearing disorders that arise from developmental perturbations in the central auditory pathway. CAPDs are a heterogeneous group of conditions characterized by difficulty performing different auditory tasks, including sound localization. To accurately process binaural cues for sound localization, the auditory brainstem form precise circuits and elaborate two giant specialized synapses, the endbulb and calyx of Held (Fig.1). Understanding the cellular and molecular basis of how the auditory brainstem circuit assembles and forms specialized synapses to mediate the early stages of sound localization will help us uncover the causes and pathogenesis of some CAPDs and develop new treatments.

To map the cellular events underlying auditory brainstem circuit assembly, I will determine how and when SGNs innervate bushy cells and form endbulb synapses by visualizing SGN central processes and their endbulb terminals through sparse genetic labelling using Neurog1-CreERT2 and a Cre reporter (Fig. 2).

Sparse labeling of individual SGN central processes and their associated endbulb terminals will be induced by administering a 0.5 mg dose of tamoxifen to Ngn1-CreERT2; tdTomato mice at E9.5 (the start of neurogenesis of the SGNs) or E12.5 (the end of neurogenesis of the SGNs). Four embryos or pups will be collected on E15.5, E17.5, P0, P6 and P21. These stages should encompass the axon outgrowth, targeting of postsynaptic bushy cells in the VCN, the beginning of synaptic formation, and the maturation of the endbulb synapse. The whole embryo head or cochlear nucleus will be fixed and 40 µm coronal or sagittal sections will be prepared. Postsynaptic bushy cells will be labeled using Mafb antibody or the Mafb-GFP allele. Images of the central process and endbulb synapse will be acquired using a confocal microscopy throughout the depth of the section for optimal reconstruction. Key time points of each cellular event will be defined and the morphology of the SGN central process, the endbulb and the postsynaptic bushy cells at each stage will be documented. These studies will generate a comprehensive map of the circuit assembly that will be an important resource for the future studies.
2) In what capacity will the student participate in your project? What tasks might the student be expected to complete and what skills might be required of the student?

All the proposed experiments, including mouse breeding, genetic labeling, tissue collection, immunostaining and image analysis will be conducted by the student under the guidance of the faculty. The student will discuss the project and the progress of the result with the Faculty in a weekly meeting. The student is expected to read research articles related to the project and carry out the experiments. The student is also expected to do an oral presentation and write a report for the project and the results at the end of her summer research. The student is required to have abilities of reading scientific articles, handling animals (mice) and using instruments such as cryostat and confocal microscope to collect accurate data.

3) Provide a short paragraph including both personal and professional biographical information.

I obtained my veterinary medicine degree and M.S. Degree in Biochemistry from National Taiwan University in Taiwan. I came to the United States in 2001 to pursue my Ph.D. in Neurobiology and Genetics at the Rockefeller University at New York City and obtained the degree in 2007. I then did my postdoctoral fellowship at Harvard Medical School from 2009 to 2015. I published 14 peer-reviewed articles and was the first author in seven of them during my Ph.D. and postdoctoral research. I was awarded Alice and Joseph E. Brooks Fund Postdoctoral Fellowship from Harvard Medical School from 2010 to 2012 and Ruth L. Kirschstein National Research Service Awards Postdoctoral Fellowship from National Institute of Health from 2013 to 2015. I came to Loyola University Chicago as an Assistant Professor in Biology in 2016 and am currently a core faculty member in Neuroscience Major in the department.