The Academy of Applied Sciences and Loyola University Chicago are proud to announce the continuation of an exciting program designed to give high school students a rare opportunity to engage in cutting-edge scientific research.

The Research and Engineering Apprenticeship Program (REAP) is looking for current high school students of exceptional academic merit who are considering a career in science or science related areas.

Successful applicants to REAP will spend a summer at Loyola working in a close relationship with one of our top scientists on an ongoing research project. In addition to the opportunity to work with a research active scientist in a significant area of study, participants will receive a stipend of $1,500.00.

Many students working with Loyola professors have published papers in the professional literature and have presented their findings at regional and national conferences. This is an invaluable experience and provides an enviable set of credentials for students planning on applying to undergraduate, professional or medical schools.

REAP is a high school apprenticeship summer program for talented high school students from underserved and underrepresented groups in science, technology, engineering and mathematics (STEM). To be considered underserved and underrepresented, REAP students must self-identify as meeting two of the criteria listed below:

- Student self-identifies as qualifying for free or reduced lunch.
- Student self-identifies as a minority historically underrepresented in STEM (Alaskan Native, Native American, Black or African American, Hispanic, Native Hawaiian or other Pacific Islander).
- Student is a female pursuing research in physical science, computer science, mathematics, or engineering.
- Student receives special education services.
- Student has a disability.
- English is a second language for the student.
- Student is a potential first-generation college student (parents did not attend college).
Applicants must be US citizens or have permanent resident status. REAP is a high school apprenticeship summer program for talented high school students from underserved and underrepresented groups in science, technology, engineering and mathematics (STEM). Students who will graduate from high school in 2018 are not eligible.

Applications must be postmarked no later than 28 Feb 2018. Applicants must submit a completed application form, a high school transcript, and letter of recommendation from a science teacher. The letter of recommendation must be typed and on school stationery. Letters may be submitted directly to Loyola, or included with the student's application. If included with the student's application, the letter must be place in a sealed school envelope with the recommender's signature across the back flap. If standardized test scores are available (ACT/SAT), they may be submitted but are not required.

All students applying for the REAP internship must also submit an application through the AEOP (Army Educational Outreach Program, www.usaeop.com) as well as submitting the application below. Click on the ‘apply now’ (bottom left) being sure to select ‘students.’ On the next page use the drop down box and select ‘REAP.’ Follow the rest of the directions.

Once students are notified of their selection, they will work out the details of their beginning/end dates with their individual faculty mentor. Projects typically begin at the end of June or beginning of July, and end in early-mid August, but scheduling is somewhat flexible. Students can expect to spend approximately 25-30 hours on campus each week as part of this program. PLEASE NOTE THAT REAP IS NOT A RESIDENTIAL PROGRAM. WE CANNOT PROVIDE HOUSING FOR APPRENTICES ON CAMPUS.

Questions concerning REAP may be directed to Dr. William Kroll at 773-508-3287 or via email (wkroll@luc.edu).
Please complete questions 1-8 on this form, and type your answers to question 9 on separate sheets. Applicants must submit this application, a high school transcript, and a letter of reference from a science teacher. Your teacher must print this letter of support on school stationery. These letters should comment explicitly on the applicant’s ability to engage in university level research. The letter may be sent directly to the address below, or may be submitted with the student’s application. If submitted with the student’s application, the letter must be in a sealed school envelope with the author’s signature across the back.

1. Name ...........................................................................................................

2. Social Security Number: ...........................................................................

3. High School attended ..................................................................................

4. Expected date of graduation: .....................................................................

5. Please indicate the research area you most wish to work with this summer by placing a “1” next to it. Place a “2” next to the research area you would like to work on if you are not able to get your first choice.

___ Dr. Daniel Cavanaugh, Dept. of Biology, Loyola University Chicago

Type II diabetes is caused by a variety of factors such as aging and obesity. The treatment of type II diabetes is by injection of synthetic therapeutic drugs. Many studies have shown that the complexes of vanadium can lower glucose levels both in vitro and in vivo. We will explore a series of new type of vanadium complexes supported by a series of new bidentate ligands. The advances in this project will provide a rational design and systematic studies for discovery of highly efficient agents for Type II diabetes.

___ Dr. M. Paul Chiarelli – Dept. of Chemistry, Loyola University Chicago

The lack of safe drinking water is believed to be leading cause of death and disease throughout the world. Recently there has been concern about the presence of a new class of pollutants derived from personal care products, pharmaceuticals, water disinfection by-products, and illicit drugs that are not removed during the water treatment process that is carried out to make water drinkable. These new classes of pollutants may exert adverse environmental and human health effects at low concentrations. The goal of this research is to identify new pollutants. Students who take part in this project will sample water from a variety of sources (e.g., Lake Michigan and the Chicago River). Students will also be introduced to and gain experience with state-of-the-art chemical instrumentation based on liquid chromatography and tandem quadrupole mass spectrometry used for environmental analyses in the identification of these new pollutants.

___ Dr. Colleen Conley – Dept. of Psychology, Loyola University Chicago

Supported Mindful Learning (SMiLe): The Psychological and Neurobiological Benefits of Mindfulness

We are collaborating with the science team at Headspace to run an 2-month intervention for depressed college students. The intervention entails using Headspace, an
online/mobile application delivering brief, guided mindfulness activities, and connecting with a small peer group online (through a hidden, private Facebook group) to give and receive encouragement and support. We are using self-report and electroencephalography (EEG) data to investigate the effects of the intervention on various outcomes:

- Distress: depression, anxiety, distress, positive and negative affect
- Positive well-being: savoring, happiness, spirituality, self-compassion
- Skills and strategies: mindfulness, rumination, self-regulatory self-efficacy
- Relational skills and styles: social connectedness, prosociality, empathy, compassion
- Participants’ goals, motivations, engagement, and perceived supportive accountability via the online peer groups

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**Dr. Wei-Tsung Lee – Dept. of Chemistry, Loyola University Chicago**

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. The student would directly contribute to one of several ongoing research projects in the lab. He or she would join a team of 1-2 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.

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**Dr. William Rochlin – Dept. of Biology, Loyola University Chicago**

The Rochlin lab studies axon guidance during embryonic development using targeting of taste axons to taste buds in mice as a model system. The project will focus on the role of Eph/ephrin signaling in this targeting. Ephs and ephrins are cell surface proteins that bind to one another to effect changes in cell motility. In the nervous system, Eph/ephrin interactions are typically repellent, but they can also promote branching, outgrowth, or stabilization. We will be examining the distribution of Ephs and ephrins in the tongue and studying nerve targeting in mice lacking subsets of ephrins. Taste bud cells are continuously replaced, so there must be a mechanism for re-establishing connections between axon endings and new taste cells even in adults, which may also involve Eph/ephrin signaling. Taste axons are capable of re-establishing functional contact after injury as well, which may also involve developmental mechanisms. Studying targeting in the developing taste system may shed light on both maintenance and recovery of function following injury in adults, and also yield principles that are relevant to regeneration of brain and spinal cord axons.
6. Local Address (include apartment number if applicable as well as zip code):

7. Local phone number: ________________________________

8. Email address: ________________________________

9. a). Describe any scientific research experience you might have (lack of such experience does not disqualify applicants for the REAP). Specify the nature of the research, your role in the project, and where and when the research took place. b) Explain why you wish to work on the project you designated as your top choice in question 5 above. Your answer should reflect your knowledge of the general area of the research project as well as underscore any experience you have in this area or special skills you have that would make you a good choice for this project. Your answers for this question should not exceed three typewritten pages.

All application materials must be postmarked no later than 28 Feb 2018 and should be mailed to:

Dr. William Kroll  
Loyola University Chicago  
Department of Biology  
Life Sciences Building 229  
1032 W. Sheridan Rd.  
Chicago, IL 60660