

A SUMMER OF STEM AT LOYOLA--AND MORE!!

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). Applicants must be US citizens or have permanent resident status. Students who will graduate from high school in 2019 are not eligible. Additionally, to be considered underserved and underrepresented, REAP students must self-identify as meeting one or moreof 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).

Applications must be postmarked no later than 28 Feb 2019. 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**](http://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. The deadline for that application is also 28 Feb 2019.

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).

## REAP 2019 APPLICATION

Please complete questions 1-8 on this form, and print 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 letterhead. 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, etc.

 **Dr. Michael Burns – Dept. of Biology, Loyola University Chicago**

The research in the Burns lab is focused on the human microbiome, that is, the collection of microorganisms that live in and on us. While scientists in the field are continuing to discover new and exciting roles for the microbiome, we still don't have a very clear idea of all the factors that can influence and change it. Current investigations in the Burns lab are focused on how environmental, dietary, and pharmacological agents alter the gut microbiome. Examples of this include, BPA and BPS in plastics, artificial sweeteners, and chemotherapy drugs. We have an experimental model in place that allows students in the lab to design and execute these tests using a combination of microbiology and bioinformatics*.*

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

The Lee lab focuses on design of well-defined complexes as homogeneous catalysts with bi- and tri-dentate ligand and earth-abundant, first-row transition metals. The application will also include the activation of small molecules like dinitrogen, dioxygen, carbon dioxide, and hydrocarbons such as methane. In addition, we will also develop the inorganic/organometallic molecules for the conversion and storage of renewable energy​.

 **Dr. Ken Olsen – Dept. of Chemistry, Loyola University Chicago**

There are 2 major projects ongoing in my laboratory, listed below. The REAP student could work on either of them depending on his/her interests.

Molecular Dynamics of Ligand Protein Interactions

This is a computational project that involves simulating how small molecules bind to proteins. We are currently looking at the binding of gasses to globin proteins like hemoglobin and myoglobin. We are also examining control mechanisms by investigating allosteric enzymes and G-proteins involved in signal transduction. The student would learn about computational methods used to both simulate the motions of protein molecules and to display these motions as a movie. Due to the computer cluster available in the laboratory, this type of project is likely to be finished during the summer.

Molecular Dynamics of Drug Excipient Interactions

We are also interested in drug-polymer and drug-surfactant interactions. The student would learn about computational methods used to both simulate the motions of proteins and other molecules and to display these motions as a movie on her own computer. The simulations would be run on advanced computers in my research laboratory that allow the problem to be broken into many smaller calculations, speeding up the entire process. **No computer programing is required for either project.** All of programs already exist and are ease to use. The emphasis of both projects is on understanding how molecules interact in solution and on crystal surfaces. If the results are as good as previous simulations, the project is likely to lead to a publication.

 **Dr. Hui Ye – Dept. of Biology, Loyola University Chicago**

We live in a world full of the electromagnetic fields that are generated by various resources, such as your cell phone, radio, TV station, etc. At the same time, electromagnetic fields have been carefully designed to control brain activity, as seen in deep brain stimulation (DBS) and transcranial magnetic stimulation (TMS), for the treatment of several neurological diseases, such as Parkinson’s disease and epilepsy. How does the electromagnetic field interact with the brain cells and control their behavior? In the Ye lab, we use a model system (Aplysia californica, a sea slug) in neurobiology to answer this question. Students will get hands on experience in microdissection of the neural tissue, as well as recording neural activity from single cell and from a large population of cells. This fundamental cellular work will provide scientific bases for the clinical practices of DBS and TMS.

1. Local Address (include apartment number if applicable as well as zip code):
2. Local phone number:
3. Email address:
4. 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 2019 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**