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 summer 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 one or more 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 in 2016 are not eligible.

Applications must be postmarked no later than 22 April 2016. 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. Jessica Brann, Dept. of Biology, Loyola University Chicago

Our understanding of repair and regeneration in the nervous system is limited at best. The brain exhibits a regenerative capacity in three key areas, one of which is the olfactory system, that undergo continuous cell loss, replacement, and growth. It is an excellent model system because it is easily accessible and we know many details about the mature circuitry involved in odor detection. In addition, the neurons born from the resident neural stem cells are the same type of neuron we might be interested in replacing in neurodegenerative diseases. However, the specific molecular players required to initiate the neural stem cell activation process are unknown. We are therefore interested in examining the role of olfactory marker protein (OMP) in this process. Our hypothesis is that OMP is required for the genesis of new neurons in the olfactory system. We are currently investigating at which point this protein exerts its effects, and whether it is necessary or sufficient for this process. The results from these experiments will aid in the identification of molecular and cellular players involved in neuronal growth, differentiation and maturation.
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
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 beta-ketoiminate 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. Ken Olsen – Dept. of Chemistry and Biochemistry, Loyola University Chicago
Dr. Olsen has three possible projects for an apprentice in his lab:

a). Crosslinked Inside-Out PEGylated Hemoglobins as Potential Blood Substitutes
This research involves the synthesis and purification of a modified hemoglobin that could function as a potential blood substitute. The student will learn how to purified hemoglobin from red blood cells and then modify it with crosslinking and PEGylation reagents. The student will also study the biochemical properties of the crosslinked, PEGylated protein, such as thermal stability and oxygen affinity.

b). Development of New Photodynamic Therapy Agents
This research involves the development of photosensitive reagents that can be used to attach cancers. The student will modify hemoglobin and bovine serum albumin with photoreactive dyes and test the ability of these modified proteins to kill cells when light is shined on them.

c). Computer Simulations of Enzyme-Substrate Interactions
This research will allow the student determine the way in which enzymes bind a substrate or inhibitor. These results will then be used to design new antibiotics to combat bacterial infections. The research will involve advanced molecular graphics software and Linux workstations. No computer background is needed but the student will learn a lot about both computers and protein structure.
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 22 April 2016 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