# 2019 Tulsa Undergraduate Research Challenge
# JUNIOR SCHOLARS PROGRAM

The TURC Junior Scholars Program recognizes local area high school juniors with outstanding potential for a career in research by providing opportunities to participate in cutting-edge research projects. The program builds upon the nationally recognized Tulsa Undergraduate Research Challenge (TURC) program and includes in-depth work with a research team, access to modern instrumentation, and potential opportunities to participate in the research dialogue through publications and presentations.

**Benefits of Being a TURC Junior Scholar** TURC Junior Scholars are immersed in a research atmosphere that is usually reserved for graduate students. Each scholar works with a faculty research mentor and research team on a nationally significant research project. In addition to working closely with a faculty mentor, each Junior Scholar is paired with a TURC undergraduate mentor who has considerable experience with the project from a student's point of view. A range of modern equipment is available to support the research – such as facilities for materials fabrication, modern chemical and biological analysis facilities, and electron microscopy resources that are among the best in the southwest. TURC Junior Scholars participate in summer research presentations and are invited to TURC lectures and functions during the academic year.

**Junior Scholar Research Opportunities** Research opportunities for the summer 2019 program span a range of disciplines and involve a variety of time commitments. At this time, we anticipate providing opportunities in the following project areas:

**Viral Diseases and genome characterization of viruses.** Dr. Akhtar Ali, Virology, Department of Biological Science. Viruses have long been known to directly or indirectly impact humans. In Dr. Ali's lab, JTURC projects are generally focused on how to isolate and purify viruses, known and unknown viruses, and determine phylogenetic relationships with previously reported viruses. A number of molecular techniques will be used to address the objectives above such as virus purification, visualization of virus particles by Transmission Electron miscopy (TEM), isolation of nucleic acids (RNA/DNA) from virus particles, detection of viruses by serological and molecular techniques, using reverse transcription polymerase chain reaction (RT-PCR), cloning and sequencing.

**Reaction discovery and development** Dr. Angus Lamar, Organic Chemistry. Nitrogen is a key atom found in nature, materials science, and synthetic pharmaceuticals. It is of great desire in the drug discovery community to install nitrogen functionality at late stages in the synthetic pathway to a bioactive core. In the Lamar Research Group, we aim to develop practical methods to accomplish this challenging goal by selectively inserting carbon-nitrogen bonds into relatively complex molecules. Our approach employs a mild, visible-light-promoted generation of nitrogen-centered radicals from readily available, inexpensive sources. The projects involved cover a range of disciplines and provide experience in the fields of catalysis, drug discovery, organometallic chemistry, organic synthesis, and medicinal chemistry.

**Biofuels** Dr. Hema Ramsurn, Russell School of Chemical Engineering. Renewable or Non-renewable: Which shall it be? The Ramsurn lab works in two distinct energy-related areas: biofuels/biobased products and gas (methane)-to-liquid conversions. Some of the ongoing projects that students can work on include: (1) biofuel production in supercritical (high temperature and pressure) water as a green solvent, (2) synthesis of biomass-derived carbon supports that can be used as catalysts and for water filtration, (3) co-liquefying biomass and coal to produce fuels and chemicals, and (4) gas-to-liquid conversions like methane to benzene (fuel) using catalysts prepared in-house. The proposed projects provide the students with an opportunity to work in a number of engineering areas including catalysis and reaction kinetics.

**3-D printing** Dr. Gabriel LeBlanc, Department of Chemistry and Biochemistry. Chemical Compatibility of 3D Printed Parts. 3D printing is poised to change the way we think about...everything. This includes the way we perform chemical reaction and analysis. While the excitement about 3D printing is sky-high, there is surprising little information out there about the interactions between the materials we 3D print with and the chemicals we (as chemists) are interested in using with them. In this project, we will evaluate these interactions using a variety of techniques in addition to gaining experience with 3D printing.

**Design and development of devices to aid persons with disabilities** Dr. John Henshaw, Department of Mechanical Engineering. Design and development of devices to aid persons with disabilities. Dr. Henshaw's TURC projects generally relate to the MADE at TU organization (Make a Difference Engineering). MADE at TU students work on a wide variety of projects aimed at improving the lives of persons with physical or developmental disabilities. TURC junior scholars will collaborate with TU students and Dr. Henshaw to design, fabricate, and test various devices for persons with disabilities.

**Biochemistry of disease** Dr. Robert Sheaff, Department of Chemistry and Biochemistry. Students may work on one of three projects. 1) Drug characterization: Identifying the biologic target of novel chemotherapeutic agents. 2) Cancer biology: Investigating the role of the tumor suppressor protein p27kip1. 3) Ethanol toxicity: Investigates how ethanol inhibits protein synthesis. All projects

involve working with tissue culture cells and various biochemical assays to measure cell viability and activity of bio-molecules.

**Experimental nanotechnology** Dr. Erin Iski, Department of Chemistry and Biochemistry. In the Iski group we use a Scanning Tunneling Microscope (STM) to study processes which occur at a distance of a few nanometers (10- 9 m). There are two complementary projects. The first investigates amino acid molecules on a gold surface with a particular focus on how strongly the molecules are binding to the underlying surface. The second uses electrochemistry to form a single, silver halide layer on a gold surface. This layer is unusually stable and the factors leading to its stability are of great interest. Both projects utilize the microscope and require computer optimization of the images. The projects provide an unusual blend of physics, physical chemistry, nanotechnology, and materials chemistry.

**Stability of sports supplements** Dr. Gordon Purser, Department of Chemistry and Biochemistry. l-Arginine ethyl ester (LAEE) is a nutritional supplement available as a substitute to l-arginine for athletes looking to improve endurance or performance. It is hypothesized that there is a higher efficacy associated with LAEE due to an assumed higher bioavailability and stability in physiological environments, though this is not confirmed in the scientific literature. The hydrolysis of LAEE into l-arginine and ethanol is a pH dependent reaction that occurs readily at physiological pH values. However, the mechanism is not well understood. This project explores the kinetics and mechanism of that hydrolysis.

James Joyce Quarterly. This position offers an opportunity to explore the world of publishing while also digging into the works of James Joyce, one of the world's most influential and widely-studied writers. You'll develop your writing skills, learn what editors do, develop social media strategies, and have an opportunity to read deeply and think hard about Joyce and his world.

Oklahoma Center for the Humanities. In 2019-2020, the Center will organize research and develop over 30 public programs on the topic of *play*—an idea that can encompass art, gaming, sports, writing, creativity, and more. You'll have an opportunity to explore some aspect of this topic while also gaining practical skills in program development, marketing, and collaboration in Tulsa's nonprofit world.

**Responsibilities of a TURC Junior Scholar** The summer research experience is intensive and each Scholar is expected to participate five full days per week **(Monday through Friday, 9:00 a.m. to 5:00 p.m.)** for the duration of the program. Applicants should be aware of the requirements and time commitments when they apply.

**Program Duration** The research experience is eight weeks in duration. All TURC Junior Scholar

Program projects will be scheduled between June 4 and July 31, 2019.

**Requirements for Applicants**

- *Applicants must be local area juniors*. Freshmen, sophomores, and seniors are not eligible.
- Applicants must have at least a 3.5 cumulative GPA in a rigorous high school curriculum.
- Applicants must have a composite ACT score of at least 28 or a combined score of at least 1260 on the Critical Reading and Math portions of the SAT.
- Other requirements are listed on the TURC Junior Scholars Application Form.

**Program Details**

- **Application Procedure.** TURC Junior Scholars Program Application forms are available on-line at http://utulsa.edu/research/turc/turc-junior-scholars-program/. **Applications must be postmarked by, delivered to, or emailed to the TU Office of Admission no later than 4:00 p.m. on Wednesday, April 10, 2019.**
- **Decisions on Applications.** All applications will be reviewed by a faculty selection committee, and decisions will be based on merit, taking into account all information provided by applicants.

• **Cost.** This is a zero-credit non-residential program; therefore, there is no tuition. Each scholar will be responsible for his or her own housing and personal expenses. The University of Tulsa does not discriminate on the basis of personal status or group characteristics including, but not limited to individuals on the basis of race, color, religion, national or ethnic origin, age, gender, disability, veteran status, sexual orientation, gender identity or expression, genetic information, ancestry, or marital status. Questions regarding this policy may be addressed to the Office of Human Resources, 918-631-2616. For accommodation of disabilities, contact TU's 504 Coordinator, Dr. Tawny Rigby, 918-631-2315. To ensure availability of an interpreter, five to seven days notice is needed; 48 hours is recommended for all other accommodations.