

Overview

Can high school students do scientific research? The answer is YES only if a mentor has great passion to motivate students to explore youth's full potential and energy. In the past decade, we dedicated our expertise in research and teaching to encouraging more than 150 extraordinary high school students' research enthusiasm to produce high quality scientific research. Most of these research were published on peer review journals, actively presented on professional meetings, won research competitions, such as Regeneron/Intel STS, Siemens Competitions and Intel International Science and Engineering Fair (Intel-ISEF) awards in national, regional and state awards, etc.



National Graphene Research and Development Center (NGRD) started to offer Youth Scientist Program (YSP) for high school students since 2011. In this program, our students enjoyed research opportunities working with advanced computers, collaborating with brilliant minds, and pursuing high achievement in scientific research. Research skills are trained that will benefit them in future endeavor, and most college bound alumni of YSP got admitted to elite schools such as MIT, Harvard, Stanford, Princeton, Yale, Caltech, Columbia, UPenn, Cornell, Brown, Duke, U Chicago, Carnegie Mellon, and UC Berkeley, etc. Some of younger alumni are admitted to MIT-RSI (Research Science Institute), Simons Summer Research Program at Stony-Brook University, The Science and Engineering Apprenticeship Program (SEAP) at US Naval Research Lab, Summer Internship Program (SIP) at National Institute of Health, etc.

In 2019, there are 20 alumni were admitted by top universities, including 4 Harvard, 2 MIT and 2 Stanford.

Youth Scientist Program (YSP)

In YSP, classes are roughly divided into three phases:

1. Basic Training

Here we provide a student-centered and project-oriented learning. Students will learn science knowledge and scientific research skills, such as, physics and chemistry knowledge and basic scientific reading and writing skills, for research projects. More universal computation skills are also taught, such as using Linux, writing scripts, collecting data, plotting view graphs and editor

for professional writing, etc. With foundations laid throughout this session, students are prepared to execute a real research project.

2. Project Execution

By exploring literatures, a student should land an unsolved, cutting-edge problem as his/her research project in one of the following categories: Physics, Chemistry, Biology, Molecular Biology, Biophysics, Bioengineering, Neuroscience, Environmental Science, Materials Science, Earth Science, and Geology. Students will conduct the research through computation utilizing advanced computer resources. By the end of this program, each student should draft a professional research paper and a viewgraph for oral presentation in a symposium with participants from the entire class and friends and families.

3. Research Papers

For each project from YSP, mentors will help students to revise the research paper to meet professional publication standards. With mentor's approval, research papers may be submitted to kinds of research competitions and professional society meetings. At the mentor's discretion, some research papers could be submitted to the professional peer review journals for publication.

Mentoring Types:

1. Summer research on-site class: 10-16 students, last 10 weeks in the summer;
2. Week-end on-site class: 6-10 students, last 8 months during the school year;
3. Cluster distance class: 4-6 students, last 8 months during the school year;
4. Individual class both on-site and distance: 1 student, both starting time and total classes are flexible.

Costs and Dates

The classes cost: per student is \$11K for 120-hour class for participating YSP.

The individual class cost: per hour is \$330.

The whole summer research program will last 10 weeks or equal to 700-1000 research hours. The next summer class will start at 06/17/2019 and end at 08/23/2019.

Scientists as Mentors and Supervisors

Dr. Luo and Dr. Qian have been in research fields for more than 20 years in top institutions and universities such as, the Chinese Academy of Sciences, National Renewable Energy Lab, University of Illinois at Urbana-Champaign, and Carnegie Institution for Science, etc. They

have published papers on top peer review journals (Physical Review Letter, Physical Review B and Journal of Physical Chemistry C). Some of them have been research highlighted by Nature, Scientific American, New Scientist, etc.

Dr. Luo is also the awarded mentor of Siemens foundation in 2012;

Dr. Luo has quite a lot of mentoring experience for high school students' research, including in high school campus. She worked as senior research lab director at Thomas-Jefferson High school for science and technology between 2015-2019.

Alumni and Achievements

In the past seven year (2011-2017), YSP has produced 2 Siemens National Finalists, 17 Siemens Regional Finalists and 62 Siemens Semifinalists that are based on YSP research projects. Our Siemens awarding rate is about 75%. Beyond Siemens Competition, our students were selected as Intel-ISEF finalists, first places in the state and regional science fairs in the past 7 years.

In 2019, 3 out of 5 senior students have been selected as Regeneron STS semifinalists.

Eight students presented at 2019 American Physical Society (APS) March meeting held at Boston, MA.

Recently, some students' research paper were published on peer review journals, one of them were recognized as Editor's Pick (<https://doi.org/10.1063/1.5081452>).

Our students are mainly from the great Washington metropolitan area, including Washington, D. C.: Sidwell Friends School; Virginia Fairfax county: Thomas Jefferson High School for Science and Technology, BASIS Independent McLean, Langley High School, McLean High School, Woodson High School, Oakton High School, Madison High School, South County High School, The Fairfax Christian School; Maryland Montgomery county: Montgomery Blair High School, Richard Montgomery High School, Winston Churchill High School, Wootton High School, Poolesville High School, The Bullis School; Maryland Howard county: Centennial High School, River Hill High School, Marriotts Ridge High School; Maryland Baltimore county: Gilman School, Dulaney High School.

Recently, some students are from other distance states, including Georgia State, Michigan State, California State, New York State, Pennsylvania State, as well as other countries, including Toronto, Canada, and Beijing, China.

Incoming Students

For students who enjoy intellectual challenges and fruitful research accomplishment, we would like to welcome them all. However, each student MUST pass our interview before joining our NGRD-YSP program.