**SPIRE Undergraduate Summer Research Program**

**Summer 2016**

**Program Description**

The goals of the program are to provide undergraduate students the opportunity to participate in innovative research at UNC Chapel Hill, develop professional skills as a scientist, and contribute to a scholarly community. Research opportunities exist in areas such as molecular biology, cell biology, chemistry, genetics, cancer research, and immunology. The program will run from **May 22 – July 29, 2016** and include required professional development seminars, journal clubs, and a series of test preparation workshops as well as social events throughout the summer in conjunction with other summer research programs. Research mentors for the program will be current SPIRE postdoctoral scholar. ***See the end of this application form for a list of mentors.***

**Eligibility**

Research internships are awarded on a competitive basis to students who meet the following requirements:

1) Enrolled full-time at one of the following institutions: Johnson C. Smith University, North Carolina A&T State University, North Carolina Central University, UNC Pembroke.

2) Current sophomore, junior, or senior majoring in a biological, biomedical or chemical science

3) A minimum grade-point average of 3.0

Previous research experience is not required. Underrepresented students are strongly encouraged to apply.

Students must be able to participate in the entire program (see dates above) including weekly professional development seminars, lab meetings, and poster session at the end of the summer.

On-campus accommodations will be provided.

**How to apply**- Submit application and personal statement (below)

* Two letters of reference who can comment on your research abilities, knowledge in science, work ethic, professionalism, and potential for a research career.
* Academic transcript (an unofficial, readable copy is acceptable, official is preferred)

All materials MUST be RECEIVED on or before **March 1, 2016** for full consideration.

This program is partially supported by a grant from the National Institutes of Health (NIH), National Institute of General Medical Sciences (NIGMS), Training, Diversity, and Workforce Development Division.

**SPIRE Undergraduate Summer Research Program 2016**

**Application Form & Instructions**

**Deadline for Receiving ALL Application and Supporting Materials: March 1, 2016**

**Please complete this application and e-mail to:**

Brian Rybarczyk, Ph.D.

SPIRE Summer Research Program Coordinator

[**brybar@unc.edu**](mailto:brybar@unc.edu)

**Please submit the following supporting materials to the application address**

Brian Rybarczyk, Ph.D.  
University of North Carolina at Chapel Hill  
CB#5492  
211A West Cameron Ave.  
Chapel Hill, NC 27599

• **Transcript:** Request your school to submit a copy of your transcript directly to us. Preference is given to students with a **GPA of 3.0 or above.**

• **Two Letters of Recommendation (email to** [**brybar@unc.edu**](mailto:brybar@unc.edu) **or hardcopy):** Request a science faculty instructor, an internship advisor, or other relevant individuals to send us a letter commenting on your motivation and potential for scientific research, academic abilities, motivation, focus, work ethic, and interest in a research career.

**PERSONAL INFORMATION**

**Name:**

**Female** 🞏**Male** 🞏

**Date of Birth:**

**Current Address:**

**(Number, Street, City, State)**

**Permanent Address:**

**(Number, Street, City, State)**

**Telephone:**

**E-mail address:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**DEMOGRAPHIC INFORMATION**

What race(s) do you consider yourself to be (check all that apply) OPTIONAL

🞏**American Indian or Alaskan Native:** A person having origins in any of the original peoples of North,

Central, and South America, and who maintains tribal affiliation or community attachment.

🞏**Asian:** A person having origins in any of the original peoples of the Far East, Southeast Asia, of the

Indian Subcontinent, including Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, The Philippine

Islands, Thailand, and Vietnam.

🞏**Black or African American:** A person having origins in any of the black racial groups of Africa.

🞏**Hispanic** or **Latino:** A person having origins from Mexico, Puerto Rico, Cuba, Central or South America

or other Spanish culture or origin.

🞏**Native Hawaiian or Other Pacific Islander:** A person having origins in any of the original peoples of

Hawaii, Guam Samoa, Micronesia, the Northern Marianas, or other Pacific islands.

🞏**White:** A person having origins in any of the original peoples of Europe, North Africa, or the Middle East.

🞏**Other**

(Pleasespecify)**:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

🞏 **Decline to Indicate.**

**EDUCATION**

**College/University:**

**Year in School:**

**Expected Graduation Date:**

**Major field of Study:**

**Minor:**

**Overall GPA:**

**Science GPA:**

Are you a first generation college student? 🞏Yes 🞏No

**Do you have funding (stipend/salary) from your undergraduate institution (for example through a MARC, RISE, McNair, HHMI program) to participate in summer research programs?**

🞏**MARC** 🞏**MBRS** 🞏**McNAIR** 🞏**HHMI** 🞏**RISE**

🞏**OTHER\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**The SPIRE program will provide housing for the summer, however, stipend will need to be provided by one of the programs you participate in at your home institution.**

**Please provide the contact name and information of the program director that will support your summer stipend if accepted in to this summer research program:**

Name:

Address:

Email:

Phone:

Have you participated in any summer research program(s) previously?\_\_\_\_\_\_ If so, list program(s)

Are you applying to other programs this summer? Yes 🞏 No 🞏

If yes, please list program name(s)/location:

If you are accepted into this program, would you require on-campus housing? Yes 🞏 No 🞏

**RESEARCH EXPERIENCE**

Please describe any research experience you may have. Include projects you have done for your

science courses (200 words max).

**IN WHAT AREAS OF STUDY ARE YOU MOST INTERESTED? (Choose up to 3)**

\_\_\_Biochemistry and Structural Biology \_\_\_Cell Biology and Genetics

\_\_\_ Bioinformatics and Genomics \_\_\_ Cancer Biology

\_\_\_Immunology \_\_\_Molecular Biology

\_\_\_Neuroscience \_\_\_Pharmacology

\_\_\_Physiology \_\_\_ Developmental Biology

\_\_\_ Other:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Personal Statement (750 Words Max):**

Please state why you want to participate in this summer research program, describe your short- and long-term career goals and how this program will help you reach your goals. Also include the names of the researchers you would like to work with as your research mentor (see below).

**Research Mentors and Project Descriptions**

**Dan Brown, Ph.D. (in the lab of Dr. Jiandong Liu) -**   
I study cardiac development using the zebrafish to model human heart development/structure. The Liu Lab combines genetics, molecular and cell biology to study cardiac development and function, focusing on the molecular mechanisms that link mechanical forces and genetic factors to cardiac morphogenesis. Using a variety of transgenic and cellularly labeled zebrafish lines, our lab hopes to better understand and characterize cardiac cell function, heart development/structure, and the gene signaling patterns underlying cardiac development. Our studies help to address key questions about cardiac development and function with the potential to provide novel therapeutic interventions for congenital heart diseases and adult cardiac diseases.

**Lindsey Costantini, Ph.D. (in the lab of Dr. Jack Griffith) –**

Our research studies viral replication of Kaposi’s sarcoma associated herpesvirus, KSHV (also called HHV-8). KSHV is a human oncogenic virus and associated with human cancers such as Kaposi’s sarcoma (KS). Effective antiviral therapeutics are needed for the treatment of KS. The KSHV replication proteins are appealing drug targets. Characterization of the core replication machinery with biochemical and electron microscopy techniques will enable a greater understanding of KSHV replication and the organization of viral origins of replication. We aim to characterize the structure and function of KSHV viral proteins. Using electron microscopy we are able to visualize how purified viral proteins bind to DNA, while parallel *in vitro* assays test protein functions. Together these two approaches enable us to investigate the functions of the KSHV core replication proteins. A summer research project will focus on viral replication and provide a student with introductory experience using transmission electron microscopy and training in specialized DNA and protein metal shadowing techniques.

**Elizabeth Danka, Ph.D. (in the lab of Dr. Peggy Cotter) –**Research in the Cotter lab investigates cellular interactions between members of the genus *Burkholderia*. These Gram-negative bacteria are found in soil across the world, and can infect humans, livestock, and plants. Previous work in *Burkholderia thailandensis* has found that cells can differentiate between “self” and “non-self” through the expression of a single locus. This locus, *bcpAOIB*, contains four genes that encode an outer membrane protein, a large exoprotein, an immunity protein, and a small periplasmic protein of unknown function. The exoprotein, BcpA, contains a toxin at the C-terminus of the protein. When delivered to neighboring “non-self” cells, this toxin can kill by degrading DNA. This ability allows cells to outcompete similar but distinct *Burkholderia* strains within a particular environment. By contrast, if the neighboring cells are “self” and contain the same *bcp* locus, the function of BcpA is modified such that it can alter gene expression. RNA sequencing data indicate that some of the differentially regulated genes are involved in cooperative behaviors such as the formation of biofilms. Currently, we are interested in further defining the mechanism of BcpA toxin delivery, the mechanism by which signaling occurs in “self” cells, and the role of BcpO in these processes.

**Alex Kloth, Ph.D. (in the lab of Dr. Ben Philpot) -**The Philpot lab studies the molecular- and systems-level brain dysfunction in Angelman syndrome, a neurodevelopment disorder marked by intellectual disability, seizures, sleep disturbances, and affable personality, along with clinically related disorders, such as Pitt-Hopkins syndrome. The goal of my research is to further our understanding of the molecular processes underlying these functions are disrupted in these disorders. I use techniques including slice electrophysiology, in vivo physiology, and behavior to identify disruptions of synaptic function and synaptic plasticity and use pharmacology to dissect these disruptions at a molecular level. These studies may uncover viable therapeutic strategies in the treatment of Angelman and Angelman-like disorders.