While we remain excited about offering this opportunity to you for the summer of 2020, we do want to let all potential applicants know that there is a possibility we may need to modify or cancel the program as the situation with COVID-19 progresses. Any changes will be directly emailed to all applicants.

All application documents should be emailed to Nicole Snyder (nisnyder@davidson.edu) by April 15th.

Comparing Perceptions of Sexual Violence on Twitter: Differences between R. Kelly & Brett Kavanaugh—Dr. Brian Eiler (Faculty Mentor)

Sexual violence is pervasive, yet all perpetrators of sexual violence are not created equal. Power, social status, race, and fame all may impact how individuals form attitudes towards offenders. Moreover, victim characteristics (e.g., purity, beliefs about culpability, disclosure) play a role in how perpetrators are viewed. Recent advances in computational language techniques (e.g., natural language processing, topic modeling) and complexity science (e.g., network analysis, time-series modeling, coordination) have leveraged language (e.g., Twitter/Reddit posts, open-ended survey response) to uncover the underlying psychosocial processes, sentiment, and outcomes related to a wide range of phenomena including sexual violence disclosure and response to collective trauma. This project will examine the public’s response to accusations of sexual violence against two high profile individuals: R Kelly and Brett Kavanaugh. This project will merge data science and psychology and will generally ask how the public’s response may have been differently applied to perpetrators of sexual violence due to their race, celebrity status, and context of the accusation (i.e., a documentary with many first-person accounts vs. a Supreme Court confirmation hearing). Data has already been collected (i.e., approximately 2 million tweets) and the student will focus on learning analytic techniques and examining how response emerged across these two very different individuals during the height of the #MeToo movement. This project will enable a student to become proficient in a range of these advanced analytic techniques, with a focus on natural language processing and network analysis using a variety of computational tools (e.g., R, a statistical computing environment; SEANCE a natural language processing algorithm). The successful student will be interested in the intersection of psychology, communication, and data science, have a willingness to learn (or some experience) coding, and be interested in how culturally held beliefs impact perceptions of perpetrators of sexual violence.

Designing an Optimal Parallel Priority Queue—Dr. Hammurabi Mendes (Faculty Mentor)

“The best algorithms for high performance computing systems are those designed not only with theoretical but also with systems considerations. Factors such as cache locality, non-uniform memory access locality, data layout (padding, alignment), compiler hints, etc, are critical for performance. In a multiprocessor, another critical factor is shared memory "contention", that is, the metric denoting how much threads have to wait in order to obtain exclusive access (at L1-cache level) for memory as they perform synchronized reads/writes and compare-and-swap operations. At Davidson, we have a group devoted to implement highly efficient algorithms for multiprocessors, and part of that design process is obtaining cache/memory locality, as well as contention information with libraries such as libPAPI and tools such as Cachegrind, in order to optimize concurrent algorithms. We cordially invite YOU to participate in our group! The only prerequisites are Data Structures and knowledge of C. We would be very excited to engage with our peer community in research. Please apply and come to work with us!”
Virtual Reality Publications—Dr. Tabitha Peck (Faculty Mentor)

Virtual Reality applications range from medical training, physical rehabilitation, exposure therapy, and implicit bias reduction. In the Davidson Research in Virtual Environments (DRIVE) lab we develop and test virtual reality systems to better understand how people use virtual reality and how virtual reality effects people. For example, can having a virtual-self avatar improve performance on a test or reduce stereotype threat? And, why are humans less accurate at measuring distances in virtual environments? Students interested in working in the DRIVE lab will join a team of undergraduates. Research tasks will involve running participants through user studies and collecting data from recently published virtual reality publications.

Sexuality and the Colonial Archive: A study of East Indian Company’s Deployment of Norms—Dr. Melissa Gonzalez (Faculty Mentor)

We seek a student to assist in the analysis of primary documents, namely the records of the East India Company from 1757 till the British Raj was established in 1858. Any student joining the project will be trained in reading historical primary sources as well as coding methods; no previous experience is required, but patience with hard-to-read documents and great attention to detail are required. Knowledge of the histories of gender and sexuality would be helpful, but are not required. The project departs from the premise that the East India Company laid the groundwork for the construction of Indians as a racialized people subordinate to the British, and for the British Government to fully take control of India. Documents to be studied include the Minutes and Memoranda of the Council of India, the General Correspondence of the East India Company, the Board of Control Records, the Public and Judicial Department Records, and the Political and Secret Department Records, particular to the Indian subcontinent. Students will help code the materials consulted for common themes, terms, and phrases relating to the sexuality of Indian subjects. The records have been partially digitized, and access will be arranged with assistance from the library, digitally from the Davidson campus.

A Historical Analysis of Patient H.M. in Textbooks—Dr. Kristi Multhaup (Faculty Mentor)

Our project will be of interest to students studying psychology, neuroscience, and/or history of science. H.M. is a famous case study of a young man who had surgery to reduce his epileptic seizures; while successful in that regard, the surgery also resulted in H.M.’s amnesia. Textbooks summarizing this case sometimes suggest that H.M. could remember life before surgery but could not learn any new information, but his case is more complicated than that. Our project will examine textbooks’ accounts of H.M. over five decades. We will compare the textbook accounts to one another and to the primary source literature, and potentially to two lesser known cases, P.B. and F.C. Our goal is to document this case study of collective memory (here we define that as what a field “remembers” through textbooks) and interpret how variations or similarities across decades contribute to the collective understanding of H.M. and the impact of his case on the broader field of memory studies. A student who joins our team would score and analyze the textbooks alongside a Davidson student, catalog primary sources, and read and interpret scientific literature. It is a great opportunity to develop research skills and contribute to a work that we intend to submit for publication.
**Enzyme Engineering**—Dr. Hanna Key (Faculty Mentor)

Enzymes are highly active and selective catalysts for organic reactions that sustain life. Evolved over millennia, the specific structures of enzymes are tailor-made to catalyze the precise reactions for which they are needed. Due to their excellent catalytic properties, synthetic chemists have long exploited natural enzymes outside of biological systems to aid in the synthesis of important, abiological, organic compounds, including materials and medications. However, the contribution of enzymes is limited in synthetic chemistry, due to the specificity of enzymes to react with only a limited number of organic molecules. In Prof. Key's research group, we re-engineer the structures of enzymes with an accelerated version of natural evolution to make them suited to react with alternative compounds that are needed in synthetic chemistry. Specifically, we are interested in engineering transaminase enzymes, which form products with carbon-nitrogen bonds (amines). Amines are key functional groups in medicines and other biologically active molecules, and our research aims to create new methods to synthesize amines using transaminases that have been engineered to be more efficient and selective than catalysts and methods that are currently used for amine synthesis. Undergraduate students contribute to all aspects of this research, including the evolution of the enzyme structure, the synthesis of new substrates to react with the enzymes that have been engineered, and the evaluation of engineered enzymes to react with those substrates.

**Water Quality Analysis**—Dr. Anika Bratt (Faculty Mentor)

This summer, my students and I will be monitoring water quality in local lakes and ponds around Davidson. We will measuring the nutrients like nitrogen and phosphorus in the water as well as other parameters that can influence how these lakes function, like the amount of oxygen in the water and the pH. We will be doing this work with kayaks. Over the last few summers, some of the local ponds have experienced harmful algal blooms (some species of algae produce toxins that are harmful to mammals); last summer, one of these blooms actually killed a dog. Therefore, we will also be collecting algal samples throughout the summer and culturing them in the lab to try to figure out what promote these algal blooms. This work is important locally because it will help managers understand what controls water quality and algal blooms. However, this work is also important to our understanding of the ecology of algal blooms, which is becoming a global problem.
**Coming to America: Transnational Lives of Ghanaians in the US—Dr. Joseph Ewoodzie (Faculty Mentor)**

The selected student will work with my collection of family letters. Recently, my father discovered about 2,000 letters, mostly correspondence between my grandfather in Ghana and his children in the U.S. between 1970 and 2000. The student’s task this summer will be to read through portions of the letter and help me code. To prepare the student for this task, I will provide the student with introductory research methods readings and teach them how to code primary data. I will also teach the student how to use NVivo, a qualitative research software. They will code for three main things, the three main objectives of the overall project: motivation for international migration, the process of migration, and the consequences of migration. The student will focus primarily on the consequences of migration especially on discussions about remittances. From the letters, we will learn about remittances from both the point of view of the sender and the receiver. We will compare what we learn to what other researchers have written about the subject.

**Developmental Neurobiology—Dr. Barbara Lom (Faculty Mentor)**

My lab is interested in understanding how neurons are born, get their unique shapes, and ultimately create a functional nervous system. We use zebrafish embryos in a line of research that investigates how the Slitrk genes influence the development of specific neurons. These genes are interesting in part because they resemble a hybrid of two other molecular families (the slits and the trks), each known to be very important in numerous aspects nervous system development. The Slitrks are also interesting because mutations in humans have been associated with a wide variety of neuropsychiatric situations such as OCD, schizophrenia, Tourette syndrome, and sensory challenges. We use tadpoles in a line of research that studies how the optic nerve can regenerate after injury. Specifically we are investigating how patterns of sensory input (light) and neurotransmitters each affect optic nerve regeneration. Finally, we also explore environmental agents that can compromise neuronal development and regeneration (pesticides, plasticizers, etc.). Overall, our lab uses a variety of cellular, molecular, microscopy, and behavioral techniques to understand how the embryonic brain forms in accessible vertebrate embryos.