

Neoscholar Evaluation Letter

Evaluation of: Qianhao Lucas Nie. Course Description: The Molecular Biology of Memory and Memory Diseases (MBMMD) Research Course guides students to develop the mindset of a research scientist. Students learn to ask questions, not simply to absorb answers. The curriculum emphasizes creative thinking as the means to ask and answer one's own questions. Students then devise experiments to answer their questions and prove hypotheses. To that end, the course teaches how to design and interpret experimental data. Some of the major discoveries of modern biology are used as models of scientific thinking, experimental design and, in some cases, to illustrate the serendipity that is common in scientific discovery. The course also introduces a suite of core technologies for genetic manipulations, genomic and gene expression analyses, and is especially focused on technologies applied to studies of the nervous system. Examples include methods for analyzing synapse and neural circuit function, such as calcium and voltage fluorescent imaging and electrophysiology, as well as techniques for controlling neural activity, such as optogenetics and chemical genetics. Advanced microscopy is also covered, including methods such as super-resolution and fluorescence microscopy. With knowledge of the technical tools and the 'art and craft' of experimental design, students are prepared to join research laboratories and pursue independent research projects.

Course research projects address important basic and clinical questions in neuroscience, such as mechanisms of memory formation, epigenetic transfer of memory and behavior between generations, and causes of neurological diseases such as Alzheimer's Disease. Students have the opportunity to explore topics of their own choosing. Students identify a research question on the basis of significance and tractability and to approach the question by forming a sound hypothesis. They design experiments and anticipate findings that answer questions and resolve hypotheses, accomplishments that are reviewed in final presentations and written research proposals. The research projects allow students to explore a specific topic deeply, to gain experience in developing and describing a research plan, all skills that prepare them careers in research and other pursuits in which creative and logical thinking are necessary to succeed.

Evaluation: Lucas did excellent research as a student in the Molecular Biology of Memory and Memory Diseases Course this past summer. Together with his research group, he was interested in the understanding the mechanism of remote memory recall, specifically in the phenomenon of context generalization in which a memory that is highly context-specific shortly after learning can be recalled under variant contexts at later times (remote recall). Studies have shown that immediate memory recall (in a fear-conditioning paradigm) mainly depends on the dorsal Hippocampus (dHP) while remote recall and context generalization depend on an interaction between the dHP and medial prefrontal cortex (mPFC). Lucas and his colleagues were also interested in post-traumatic stress disorder (PTSD); in humans, PTSD displays features of context generalization, as the traumatic memory is found to be triggered by variant contexts. At the outset, Lucas was especially interested in mouse research finding that training involving a multiple trauma 'memory' paradigm yielded in increased generalization, especially at remote recall timepoints. He thus wondered what role mPFC/dHP circuit interactions may play in the increased generalization in this 'PTSD' mouse model. Lucas and his team put forward the hypothesis that the mPFC plays a stronger and more continuous role in the increased generalization characteristic of doubly-traumatized mice and they devised sophisticated experiments to test it. Overall, Lucas and his colleagues undertook an investigation into one of the most complex and rapidly-evolving areas of memory research; they stood out among their peers by the choice of a project with a very high-level of difficulty and persistent efforts to grapple with technically sophisticated experimental plan.

The MBMMD Research Course occurs over a several week period during which students are guided in the development of a research project, from conception of a research question or hypothesis to its answer or proof through their design of experiments. I spoke with Lucas and his research team on multiple occasions as they endeavored to explore the literature and generate new research ideas. Through these discussions, I observed Lucas's fundamental contributions to his group's creativity and research plans. He was engaged in the scientific literature on the topic, interpreted it with considerable insight and made important contributions to the project. Lucas was notable for his motivation and the intellectual focus he brought to an advanced and complex topic, reading and understanding difficult research articles and employing advanced methods in the design of an experimental test of his hypothesis. To test the group's hypothesis concerning the effects of double-trauma on context generalization, Lucas and his colleagues devised experiments in which they inhibited either neural activity or protein synthesis in the dHP or mPFC during remote recall and then tested the mice for context generalization in a fear-conditioning paradigm. Their hypothesis specifically predicted a new therapeutic avenue for PTSD treatment might involve inhibiting the mPFC around the time of remote recall. Lucas and his research partners presented the project in an excellent seminar outlining the experimental question and how they designed sophisticated experiments to resolve it, adding anticipated therapeutic avenues and future experiments. Lucas also wrote a very good essay considering how the mPFC-hippocampal/amygdala circuitry contributes to context generalization in PTSD. His essay revealed a clear understanding of this phenomenon. It was well-organized, clear, and provided implications for therapy.

Overall, Lucas performed excellently in the course, exhibiting advanced knowledge and a great deal of dedication to understanding how neural circuits

create contextual generalization that is typical of PTSD. He has a very high aptitude for scientific research.

A handwritten signature in black ink, appearing to read "Samuel Kunes". The signature is fluid and cursive, with the first name "Samuel" and the last name "Kunes" clearly distinguishable.

Signature of evaluator: _____

E-mail address of evaluator: kunes1@gmail.com

Neoscholar Evaluation Report

Scholar Information

Name: Qianhao (Lucas) Nie
Title of Group Paper/ Individual Paper: Exploring How mPFC and Hippocampus Enhance Generalization in PTSD-like Behavior Model
Academic evaluation levels awarded by the professor: A

Evaluator Information

Name: Samuel Kunes
Full Title: Professor of Molecular and Cellular Biology

Program Information

Program Structure: 12 Advancement Courses+ 5 stages Mastertrack Research
Student time investment: A total 122 class hour
Research skills training- 16 class hours
Advancement Course- 54 class hours
MasterTrack Research- 52 class hours

Evaluation Description

The student was selected from a competitive pool of applicants to join the Mastertrack research group, where they actively participated in a research-based program. Under the guidance of renowned professors, the student conducted research projects, followed standardized academic procedures, and gained authentic research experience.

The CIS program is a comprehensive research-training initiative, consisting of a 12-week Advancement Course followed by a five-stage Master-track Research sequence. Its admissions standards and academic expectations take inspiration from those of a year-long graduate-level program, in an effort to offer students meaningful research training within a limited timeframe.

As student’s mentors, program professors and mentors provided consistent instruction and guidance through five key phases: foundational academic training, proposal development, literature and data research, manuscript review, and final defense.

Throughout the program, program professors and mentors carefully documented the student’s progress at each stage and compiled a detailed evaluation of their academic performance. We believe this assessment offers a thorough overview of the student’s strengths and areas for growth within the field.

Criteria	N/A	Poor	Below average	Average	Good	Excellent
Advancement Course 1-12						
Mid-term						
Homework						

Academic writing: Maintaining the ethical qualities of academic research paper writing and producing a high-quality research paper is challenging but essential.						
Stage 5 Paper Defense and Evaluation						
Visually: Being able to visually present research papers effectively aids in explaining them.						
Proficient: To have a comprehensive understanding of one's research topic and to be able to accurately answer questions posed by the professor.						

Please briefly explain the requirements of the research paper, your interaction with the scholar, and evaluate the student's performance in the research process.

During the Proposal stage, The student listened attentively in class. Increased interaction during future classes would be beneficial.

During the material collection stage,the student exhibited a positive outlook and attitude during class, which greatly contributed to the overall learning environment.

During the material collection stage,the student was a qualified participant in our courses and actively joined group interaction. We encourage the student to maintain this high level of performance in both further studies and research work.

During the paper refinement and review stage,the student was actively joined group discussion and sharing his thoughts with the professor.

During the presentation stage,the student performed well during the presentation and has made significant progress.

***CIS affirms that the evaluation forms and textual assessments are designed strictly according to the logical sequence of the research process. Professors and mentors meticulously evaluate students' research qualities and skills in line with each stage of the process, and rate the students' performance accordingly. If there are any questions regarding the work's academic integrity or any aspects of the research program, please contact us. We will conduct an immediate review and respond to your questions promptly.**