Intellectual Merit Criterion

Overall Assessment of Intellectual Merit

Excellent

Explanation to Applicant

This is an outstanding applicant that demonstrate high intellectual merit. They are currently enrolled in UCSD's graduate program with a 3.94 GPA and received their BA in neuroscience at Dartmouth finishing with a 3.75 GPA. This applicant has numerous publications from research experiences at the University of Iowa as a high school student, Dartmouth and UCSF. The applicant is a Siemens competition national finalist and has received awards to support their prior research (e.g. the Kamisky Family Fund Award). The applicant intends to define the genetic origin of innate aversive responses in response to threatening odors. To accomplish this, they have assembled a team of researchers that span the STEM field and come from multiple institutions. They further show nice preliminary evidence of immediate early gene induction in response to TMS in the CoA, a region that is required for fear behaviors. It is clear that the candidate will successfully complete their Ph.D.

Broader Impacts Criterion

Overall Assessment of Broader Impacts

Excellent

Explanation to Applicant

The candidate has demonstrated broader impacts through mentoring and communicating their work and science to an international audience. For example, as an undergraduate at Dartmouth, they were staff writer and president of the undergraduate journal of Science that received more that 40,000 views per month. Moreover, they wrote a first-author review in Current Biology with Alcino Silva, and they were selected as a meeting blogger for SfN. In regards to the proposal, our understanding of genetics that control innate fears is limited. Completion of this research has broad impacts in identifying unique genomic signatures and using them for future genetic manipulation and development of therapeutic tools.

Summary Comments

This is an outstanding proposal. I have only minor comments related to the research proposal itself. The addition of a non-fearful odor as a control may serve better than water alone to assist in discriminating the populations that respond specifically to fearful responses, and, if there was a way to simultaneously tag both types of cells, it may give one an idea of the unique neural ensembles that respond specifically to fear responses. This can be easily accomplished using dual-labeling techniques and older methods such as catFISH.

Intellectual Merit Criterion

Overall Assessment of Intellectual Merit

Very Good

Explanation to Applicant

Clearly a very ambitious and high-achieving student. He has outstanding grades, multiple first authored publications (though mostly in a different field), and a large number of awards, scholarships and honors. Letters are uniformly very strong. Research plan is quite vague and poorly explained though, perhaps stemming from his relatively new entry into this field.

Broader Impacts Criterion

Overall Assessment of Broader Impacts
Very Good

Explanation to Applicant
Although outreach experience to underserved populations is relatively limited, the applicant is remarkable in his science communication activities. He has served as editor of SciComm and Undergraduate research journals, and regularly writes popular science articles for a variety of venues, including well-known websites.

Summary Comments
Not a very compelling research plan, uses Arc-based labeling system to define CoAmygdala activity after TMT, but doesn't explain how system works exactly. For this kind of experiment, additional control groups are essential. For example, TMT effects should be compared to other strong odors, including those without innate aversive properties--not just water. Plan does not concretely explain why TMT-activated cells are expected to have a distinct RNA profile, nor does he well-explain how cells will be isolated (lists several methods, but which he'll use is vague). Does not explain how RNAscope will be used to validate single cell analyses.

Intellectual Merit Criterion

Overall Assessment of Intellectual Merit
Excellent

Explanation to Applicant
The is an OUTSTANDING candidate with a significant amount of research experience from both high school and college. He not only has a very high GPA, has won multiple awards, has many publications including first author publications, and has highly rated letters of recommendation. His research plan is challenging, but I think someone of his caliber could make significant contributions to understanding genes that are involved with aversive response behavior.

Broader Impacts Criterion

Overall Assessment of Broader Impacts
Excellent

Explanation to Applicant
This candidate has a significant amount of experience as a scientific editor and writer. He has written many popular science articles. In addition, he participates in an outreach program for K-12 schools to teach science to underprivileged children.

Summary Comments
This is a top student in both his intellectual merit and broader impacts. He is on a trajectory to have a significant impact to the neuroscience field.