

## Translational Question 2016:

Optogenetics has transformed the neuroscience landscape over the last 10 years through the ability to control the activity of discrete sets of neurons in real-time. While optogenetic studies have increased our understanding of functional circuits, the translational impact of these studies in many cases is still unclear. Your task for this question is to integrate basic research using optogenetics with a potential therapy for human health.

The essay should address the following points:

- Summarize the major optogenetic finding/s that form the basis for a potential therapy
  - what question(s) were being asked
  - what were the strengths/limitations of the published work
  - what new information was gained through the use of optogenetic approaches that wasn't known before
- Propose a human disease, process, or mental disorder that would benefit from knowledge gained via optogenetics
  - Discuss current preclinical findings for a human pathological condition and explain how and/or why current data based on preclinical models would benefit from optogenetics
- Propose a specific hypothesis about a potential new therapeutic approach and describe the study to test this hypothesis (i.e., describing the experimental design, the major experimental variables, important controls, and limitations of the proposed experiment)
  - Discuss the major advantage(s) of this new therapeutic approach versus what is currently available.
  - Address the major hurdles to implementing your new technology (technical and ethical concerns).

\*Of note – you are free to pick any disease, brain region, etc. for this question but you must clearly articulate the original findings, what is exciting about them, and your idea for a human application. This application does not necessarily mean optogenetic stimulation in humans – it can be information gleaned from these studies that now leads to unique insight for improved treatment or diagnostic. In one recent example (<http://www.ncbi.nlm.nih.gov/pubmed/26655188>), the authors used information obtained from optogenetic studies in rats to perform a pilot study using TMS treatment in cocaine addicts.