2017 PinS and Summer Research Proposal Guidelines:

PROPOSAL GUIDELINES

The committee looks for a well written and thorough research or creative project. For research projects, they want to understand what your research question is, what data you are collecting, how you are collecting it, and if it is realistic to the timeline you submitted. For creative projects, you should make the case that you are contributing to the field by doing something new and important. Talk with your faculty partner about your project to make sure it's feasible. Include a reference list or citation list of academic literature to make your case.

The project proposal should address the following:

- Define the research problem or creative endeavor. How does it fill a gap in existing knowledge or the extant body of creative works, and why is it important to fill that gap? What is the question you hope to answer? Why are you undertaking the project?
- Describe the research method and the research design. Why is it likely to succeed? Explain how you will collect data or recruit participants. For visual or performing arts, explain how the proposed project is not simply an effort to refine one's own skills or abilities, but connects to broader questions within your discipline.
- How does the project relate to your goals?
- What background do you have that prepares you for this project?
- What will be the final product(s) of the project?

Other questions to consider and address:

- Is the data you are collecting a new venture or could you use existing information?
- If you are requesting funds for travel, why is it necessary for you to go to the destination? If conducting interviews, explain why in-person interviews are preferable to email or Skype interviews.
- If you plan on conducting interviews, what are your questions, how are you going to find individuals to participate, and what would you do if you could not find enough participants?
- Is your question focused enough to explore in the timeline you submitted?
- What will you do with the data and findings?

****Write your proposal for a general audience, so that those outside of your discipline can understand it.****

Proposal #1

Introduction

The diurnal nature of humans has led to the creation of artificial night light, an invention that engulfs the globe to such an extent that approximately one tenth of the world's population can no longer see the night sky (Cinzano et al. 2001). While artificial light sources are beneficial for humans, their impact on natural communities that neighbor urban areas is primarily negative (Longcore & Rich 2004). Longcore and Rich (2004) along with Schlaepfer et al. (2002) provide evidence that light pollution can cause normal animal behaviors to become maladaptive when the light environment is artificially altered by humans. The shift from a formerly adaptive behavior to a maladaptive one is known as an ecological trap when caused by anthropogenic factors (Schlaepfer et al. 2002). An example of this phenomenon is male jewel beetles, which are known to mate with beer bottles that resemble a beetle carapace until they die. Ecological traps can be devastating to a population and can eventually lead to local extinction if population sizes become too low and an adaption to the novel stimulus is not obtained (Schlaepfer et al. 2002). While it is not certain that an ecological trap caused by light pollution is the reason for the decline in moth populations (Frank 1998; Fox 2013), it is apparent that moths are attracted to artificial light and could potentially suffer from decreased fitness due to this attraction (Frank 1998).

My research project will explicitly test whether light pollution has an effect on the fitness of moths, in order to assess the role of light pollution in recently declining moth populations. I hypothesize that moths in light polluted areas will have lower fitness than those in areas without light pollution because they are expending more energy flying around artificial light sources. In other words, I expect moths found in areas of light pollution to have less available lipid, glucose and glycogen stores that could be used for reproduction compared to those not affected by light pollution.

Methods

In order to test this hypothesis, I will take measurements of the lipid content, glucose and glycogen stores in 55 nocturnal Lepidoptera collected during the summer of 2015 by Kylee Grenis from areas both affected and not affected by light pollution. The moths were collected 2 times per week in July and August at 10 field sites across the Colorado Front Range (Coyote Run, Westcliff, Mountain View, Glen Eagle, Ute Trail, Loveland Trail, Forest Park, Jackass Hill, and Horseshoe Park). One lighted bucket trap was dropped off at the sites around 19:00 and picked up by 9:00 in the morning. The trapped insects were killed with carbon dioxide before being moved to vials. The collected insects are currently in the freezer at the University of Denver until the energy store analyses can be completed.

For each moth collected, I will first record a wet and dry weight of the samples in order to measure the water content for each moth. The dry samples will then be pulverized using a grinding machine in order to prepare the samples for the energy store analyses. In order to calculate the lipid content of each sample, the lipids will first be extracted using chloroform methanol and then analyzed using a vanillin assay and spectrophotometer. Following this, an anthrone solution will be used on the samples to separate the glycogen and glucose, which will then be analyzed using a spectrophotometer in order to calculate the sugar content of each moth sample. The moths will also be sexed so that males and females are tested separately, in order to evaluate any differences between the sexes.

Significance

My research will provide more information regarding the impacts of light pollution on moth populations. Specifically, if a negative relationship is found between light pollution and moth fitness, it will provide a potential explanation for observed reductions in moth community richness and abundance in areas affected by artificial night lighting. Knowing and understanding the potential effects of light pollution on moth populations is important, because moths are essential nocturnal pollinators and play a crucial role in their ecological communities. My research will also provide insight as to why it is important to study the effects of light pollution on the natural world.

Experience/Personal Goals

I worked in Dr. Murphy's lab learning ecology lab techniques for 2 quarters last year and I think that experience has provided me with the skills necessary to complete this project. My end goal for this project is to write a thesis on it in order to receive distinction in biology. Overall, I think this project will help me improve my research and lab skills, which will undoubtedly be useful for my future career in the biological sciences.

References

Cinzano P., Falchi F., & Elvidge C. D. 2001. The first world atlas of the artificial night sky brightness. *Monthly Notices of the Royal Astronomical Society* **328**:689-707.

Fox R. 2013. The decline of moths in Great Britain: a review of possible causes. *Insect Conservation and Diversity* **6**: 5-19.

Frank K. D. 1988. Impact of outdoor lighting on moths: an assessment. *Journal of the Lepidopterists' Society* **42**: 63–93.

Longcore T., & Rich C. 2004. Ecological light pollution. *Frontiers in Ecology and the Environment* **2**: 191-198.

Schlaepfer M. A., Runge M. C., & Sherman P. W. 2002. Ecological and evolutionary traps. *Trends in Ecology & Evolution* **17**: 474-480.

Proposal #2

As humans, it is to our great benefit to have the ability to analyze faces and expressions. For instance, humans can glean an incredible amount of information from brief glances at others' faces, such as emotion, age, and gender (Ambady & Weisbuch, 2010). People can also read the affective expression of a face in order to infer information about the person they are looking at; for example, people can infer personality impressions (e.g. dominant) from facial expressions (e.g. anger; Montepare & Dubish, 2003). Current theories concerning the perception of facial expressions of emotion argue that people automatically draw inferences of others' emotional *states*, or internal mental states, from the facial expressions they observe (e.g. Ekman, 1992). For example, when one person decides that another person looks angry, scientists describe this scenario as "mind reading" in which the first person recognizes the mental and physiological state of the second (Baron-Cohen et al., 2003). Yet even according to such mental-state models, the presumed adaptive function of reading facial expressions is to anticipate others' behavior (Baron-Cohen et al, 1985; Frijda, 1986). As one example, the perception of facial anger enables perceivers to anticipate aggressive behavior from another person and prepare accordingly. We take this adaptive function seriously and suggest that facial expressions are merely predictive cues for behavior. For example, when people claim a facial expression is one of "anger" they are suggesting that the person is exhibiting or will exhibit "angry" (i.e. aggressive/dominant) behavior.

We are proposing a theory of *social prospection* that focuses on behavior prediction instead of mental state inferences. According to our theory, an affectively charged face elicits a behavioral forecast (rather than a mental state inference) automatically and immediately (Weisbuch & Adams, 2012). Emotional inferences are a tangential by-product of this process and linguistic convention. For example, if an individual sees another person with knitted eyebrows and a deep frown (a prototypical expression of anger), Ekman states that the perceiver would first make an inference as to the emotional state of that expresser. Only after generating this emotion inference would the perceiver then predict that the expresser may soon act aggressively. Conversely, in our social prospection model, the individual would see the stimulus of an affectively charged face (again, prototypical anger), and immediately predict that his peer will act aggressively, thus being able to respond (avoid) the angry expresser much faster. Since social prospection posits only one step between stimulus perception and behavior prediction, people can make these predictions more efficiently and with less interpretive ambiguity than in traditional models, which require the extra step of understanding another person's mental state. Although prior work demonstrates that people can make speedy judgments of facial emotion – identifying emotions such as anger and fear after less than $1/20^{th}$ of a second of a exposure to a face (e.g. McAndrews, 1986) – it is not clear what perceivers are perceiving. Study participants simply provide an emotion label for a face and are not given any instruction on what that label means, such that perceivers could be referring to angry behavior, angry thoughts, and/or angry physiology. Ultimately, we hypothesize that (a) the *most accurate* perceivers of emotion are those that use emotion words to describe behavior and (b) emotion judgments based on facial expressions are *ordinarily* judgments of emotional behavior rather than emotional thoughts and internal states.

Using the stimulus images rated equivalently difficult across conditions in the pre-test, we have then designed an in lab study that will prime participants with the selected object images. Our independent variable in this study will be the instructions given to participants

according to random assignment (Instruction Type: external focus, internal focus, or no instructions/control). This instruction manipulation is intended to procedurally prime the participant with a particular mindset, either focusing on the external behavior of the objects or focusing on the internal mechanism or state of the objects. "Procedural priming" consists of using a certain stimulus in an attempt to activate specific semantically-related concepts in the brain in order to produce facilitation effects (Neely 1977). For example, an individual shown an image of a table will be primed with the concept of "chair." Once primed with a particular focus (internal/external), participants will then be asked to rate a block of emotionally expressive faces (IASLab Face Set). We predict that the accuracy of the emotion identification will vary
according to the instruction manipulation of the priming block condition.

There will be three conditions in the lab study, with two blocks per condition (one priming block of 3 object images and a second block of emotionally expressive faces). Condition 1 will prime the external focus, with block A using 3 priming object images from the pre-test and asking the participants to make ratings of the external behavior of that object, and block B asking for judgments of the emotion on the presented faces. Condition 2 will prime the internal focus, with block A using 3 priming object images from the pre-test and asking the
participants to make ratings of the internal state of that object, and block B asking for judgments of the emotion on the presented face. Condition 3 is our control condition. In this condition, in block A, participants will only be shown the object images without any explicit instructions for judging these images. Instead, they will simply be asked to "describe the image." In block B, participants will be asked for judgments of the emotion on the presented face.

We predict that accuracy of these emotion identifications in block B will be significantly impacted depending upon the condition in which the participant is placed. We expect increased accuracy in the External Instruction condition, in accordance with our theory of social prospection, compared to the Internal Instruction condition. We do not suspect a significant difference between the Control condition and the External Instruction condition, but do predict a significant difference in the accuracy of emotion ratings between the Control condition and the Internal Instruction condition.

We hope to collect the necessary data (from 150 participants) in April, and in early May I will help to analyze the data using SPSS. Once we have organized our data, I will have the opportunity to present our findings both to the lab group and also prepare a poster for the PINS Symposium.

I am currently a research assistant in the Social Perceptions and Attitudes lab, and have been working to create this study with Max Weisbuch, the faculty member leading the SPA lab, and his graduate student Michelle Zad. I hope to lead my own research later on in my academic career and this position is a great start to familiarize myself with the process and gain invaluable experience with research methods and the intellectual processes that go into creating a study. Next year I plan to attend graduate school for a Master's program for forensic psychology, and this research will also greatly aid in preparation for this future endeavor. My part in this study provides me with not only hands-on learning of much needed skills in research but also an introduction to advanced psychological concepts and questions in the field.