[I included the prompt and prep notes below for context. It was removed before submission.]

Prompt for Drexel:

Essay – Write an essay that addresses the following two objectives – please be sure to cover all questions listed inside each objective:

(1) The specific research area and questions you would like to pursue in graduate school.

- Why are these questions important and why are they of interest to you?
- How does this line of research fit with specific faculty members' or research groups' work at Drexel?
- What skills and experiences of yours will facilitate your graduate work?

(2) Tell us how our program will specifically lead to the next step in your career.

*Your essay cannot exceed 9,000 characters (approximately 1,500 words)

Essay
Write an essay that addresses the following two objectives. Please be sure to cover all questions listed inside each objective:

- Discuss the specific research area and questions you would like to pursue in graduate school. Why are these questions important and why are they of interest to you? How does this line of research fit with specific faculty members' or research groups' work at Drexel? What skills and experiences of yours will facilitate your graduate work?

- Tell us the type of position you would like after your PhD/postdoctoral fellowship and how our program will help prepare you for such a position.

Note: When completing your essay, please be careful not to simply reiterate experiences covered in your CV/résumé, but rather explain what you have learned from these experiences and what skills you have developed that will help you make strong contributions to the specific faculty members' or research groups' work, as well as the overall program at Drexel University.

Submit your essay with your application or through the Discover Drexel portal after you submit your application.

Notes for essay prep:

Another researcher at Drexel of interest: (having interest in more than one researcher is looked highly upon; I'm really not that interested in this guy's stuff, however.)

- John Kounios –
  - o insight vs. analytical problem solving;
  - o EEG;
  - o wrote a popular book on the topic;

(1) The specific research area and questions you would like to pursue in graduate school.
  - Semantic Control –
    - o Brain mechanisms – involvement of PFC and posterior parietal cortex

- o Neural correlates of individual differences in ability
- o Relation to action/perception systems
- ● Emotion Regulation
  - o Different emotion regulation strategies in different contexts and relative effectiveness of them
  - o Effect of training in strategies on suffering during/after adversity
- ● **Why are these questions important and why are they of interest to you?**
  - o <u>Semantic control</u> - Understanding the conceptual system is important because it is such an important aspect of what it means to be human; our brains constantly make meaning of experience; this enables getting around in the complex world in which we live, allows innovation and progress, communication, etc.
    - ▪ This area is of interest to me because my intellectual development has led me to find this area
  - o <u>Emotion Regulation</u> - Understanding mechanisms of emotion regulation is important because it plays a large part in well-being; a large percent of psychopathologies are associated with issues is emotion regulation
    - ▪ This is of interest to me because I have personally found that being consciously aware of emotional/affective experience allows me to intentionally explore different emotion regulation strategies and by doing so reduce suffering from and aversion to negative emotional experience
    - ▪ It is also of interest because this area of research has the potential to be of great benefit to others.
- ● **How does this line of research fit with specific faculty members' or research groups' work at Drexel?**
  - o Evangelia Chrysikou is specifically investigating both of these areas. Her recent (2017) research using MVPA investigated semantic control using fMRI and MVPA along with a Bayesian confusion matrix analysis. I would like to learn methods like these.
- ● **What skills and experiences of yours will facilitate your graduate work?**
  - o Research experience – DST, GF
  - o Independent learning – stats in R, fMRI course
  - o Strong background in neuroscience from my undergraduate education and continued reading of the literature
  - o Proven ability to work hard towards these goals, as I have accomplished all that I have over the last two years while working a full-time job
- (2) **Tell us how our program will specifically lead to the next step in your career.**
  - ● Gaining the skills in cog neuro methods (tDCS, fMRI – MVPA; Wessel van Dam) and analytical methods used in the lab will prepare me to conduct further research in this and other domains of cognitive neuroscience/psychology
  - ● Next step: Post-doctoral position conducting research in a related area
    - **i.** Then: if possible, a tenure-track position at an R1 university

[Everything above this was removed before submission of the essay.]

Essay – Drexel University

Nathan Lautz

As humans we think, perceive, and act so seamlessly. We have such great and lofty cognitive abilities as philosophy and mathematics. Yet an integrated, comprehensive understanding of the workings of the human mind and its underlying neural basis remains elusive. As with many areas in science, the more we learn, the more questions arise – the more we see the mystery of this complex system. I love this mystery, this puzzle. Graduate training in the Applied Cognitive and Brain Sciences (ACBS) program at Drexel University will prepare me for a career in cognitive neuroscience, where I can pursue this mystery and advance our understanding of the mind.

As a graduate student, I am interested in pursuing research on semantic memory, semantic control, and emotion regulation, all of which are studied in the lab of Dr. Evangelia Chrysikou. Within the areas of semantic memory and semantic control, I would like to apply methods such as tDCS and fMRI to elucidate the neurocognitive mechanisms underlying how we dynamically retrieve conceptual information in particular contexts. A more specific set of questions I would like to address: How is activity in perception and action systems (shown in previous research to be involved in representing concrete concepts) modulated by task demands in semantic tasks? What are the neurocognitive mechanisms of this dynamic retrieval of conceptual components? I hypothesize that tasks requiring explicit semantic retrieval of action-relevant (compared to action-irrelevant) properties of concrete concepts will result in increased activity in sensorimotor areas (an idea supported by the work of Dr. Wessel van Dam, a postdoctoral researcher in Dr. Chrysikou's lab), and that this modulation is orchestrated by networks associated with semantic control and the maintenance of task-goals. As Dr. Chrysikou has recently investigated similar questions in semantic control using fMRI, this question is relevant to both her interests and mine.

An understanding of these processes is important for many reasons. Contributing to a basic scientific understanding of something so fundamental to human life as how we dynamically represent meaning is itself a valuable thing. As humans we constantly impute meaning to experience; we categorize our experience using concepts and perceive the world based on these concepts. These processes allow us to get along in the complex, changing world in which we live, communicate with one another, and progress in science, technology, and society. The ubiquity and importance of our ability to make meaning of the world makes this an important area of inquiry. Further, increased understanding of these processes and their mechanisms has the potential to contribute to areas as diverse as education and communication sciences.

These questions are of interest to me largely because it brings me satisfaction and joy to explore the neurocognitive basis of how we make meaning. This function is so fundamental to who we are as humans. Explicating its workings is akin to increasing self-knowledge as a species, with implications beyond prediction. I find the pursuit of a better understanding of what it means to be human a worthy one. Further, I am drawn to this puzzle because of its complexity and difficulty. This is one of today's great frontiers of science, and I would like to contribute.

I would also like to study emotion regulation (ER), another area of research pursued in Dr. Chrysikou's lab. There are multifarious ER strategies available to us as humans. I would like to investigate the effectiveness of different ER strategies in different contexts. Further, I would like to explore the neurocognitive mechanisms involved in particular ER strategies. For example, in using acceptance as a strategy to regulate emotions, allowing oneself to feel whatever emotion

has arisen, perhaps we inhibit conceptual elaboration on the emotion-inducing situation (inhibiting rumination, catastrophizing, blame of self or other). This should correspond to increased attention to affective experience and decreased conceptual, self-referential processing, which would be reflected in modulation of the corresponding brain areas/networks (e.g. increased activity in ventral anterior insula and decreased activity of default mode network areas). These predictions, informed by affective neuroscience and research on intrinsic brain networks, are amenable to experimental investigation and manipulation using tools available in Dr. Chrysikou's lab.

Research on ER is laden with implications. A better understanding of ER and the underlying mechanisms is relevant to the large proportion of psychopathologies associated with deficits in ER. This research carries the potential to reduce suffering and promote well-being in this population and among humans more generally.

My interest in the topic of ER is motivated in part by personal experience. As a Buddhist practitioner, I have found that directing mindfulness (non-judgmental, intentional awareness) to affective experience during episodes of negative emotion has mitigated the intensity and valence of those experiences. Greater awareness of my emotional and affective state also allows me to more intentionally choose among other ER strategies. Beyond my interest from personal experience, I am drawn to this area of research because of its strong potential to help others.

I have worked hard to attain skills and experiences which will facilitate my graduate work. As an undergraduate at Purdue University I gained a foundation in cognitive neuroscience by structuring my course-work to focus on this and related areas (Intro. to Cog. Neuro. Honors, Readings in Cog. Neuro., Neural Systems, Theories of Concepts, Research Methods, Stats, etc.). Here I also performed data collection and analysis as a research assistant in social psychology, investigating factors which contribute to the (dis)continuation of close, interpersonal relationships and doctor-patient relationships. In the last two years I have taken a graduate-level course at the University of Cincinnati (UC), become a research assistant at the Center for Cognition, Action and Perception there, and begun my own research into the nature of concepts, all while maintaining my full-time job. In addition I have been independently working through the material of a graduate-level statistics course taught at UC. These self-driven efforts demonstrate that I have the motivation to work long hours and manage my time effectively towards achieving my academic goals.

As a research assistant at UC I have focused on a project examining learning in a motor control task. We found differences in learning trajectories between individuals and cooperating pairs in learning a difficult coordination pattern and were able to explain these findings based on principles from dynamical systems theory (DST). I have spent over 150 hours in the lab – running participants, discussing future directions for this project and others, and learning the concepts and analytical methods of DST. I gave a talk about this project at the 2019 Guy Van Orden Student Research Conference and presented our findings as a poster at Midwest CogSci 2019.

Beyond my research assistant role, I conceived and developed an experiment investigating representational aspects of tool concepts. Participants name pictures of tools or animals while their continuous grip force is measured. Based on the tenets of grounded cognition (which asserts that concepts are grounded in systems for perception and action) and using analytical methods from DST, the experiment will provide information about the content and temporal dynamics of the motor components of tool concepts. I am in the preliminary stages of first-authoring a paper on this experiment (which is currently in the data collection phase) with

my collaborators. As project leader, I gained valuable experience in experimental design, programming, data analysis in R, and, importantly, in collaborating and seeking help as necessary.

Coming into Dr. Chrysikou's lab, I will be prepared to begin research in these and other areas. I have valuable background knowledge of topics like functional neuroanatomy and grounded cognition from my undergraduate and independent studies. I also have experience designing and conducting research. Further, over the next ten months I will continue to gather skills, experiences, and knowledge that will facilitate my contribution to research in the lab. I plan to complete data-collection and analysis on my current research project and get a manuscript ready to submit for publication, complete the statistics course material I have started, and gain additional knowledge of principles and methods of fMRI through the completion of a two-part online course on this topic. I will also bring qualities like passion for the field, maturity, hard work, professionalism, dependability, tenacity, and equanimity to my graduate studies.

At Drexel University I will be empowered to secure a position as a post-doctoral researcher and eventually a professorship at an R1 university, where I can continue to contribute to the field of cognitive neuroscience.

In Dr. Chrysikou's lab I will gain experience in applying methods like tDCS and fMRI to questions important for advancing basic science, well-being, and progress for humanity. It is becoming increasingly competitive to secure faculty positions in and funding for cognitive and affective neuroscience. The ACBS program's emphasis on questions of real-world significance and rigorous methodological, quantitative, and computational training will prepare me to secure funding and produce publications of value to society. These experiences and abilities will prepare me to secure a post-doctoral and eventually a faculty position after receiving my PhD.