BACKGROUND. From our earliest hunter-gatherer days to our current industrialized lives, humans have been impressively social creatures. While most of us will never form alliances to hunt mastodons, or teach our young how to chisel weapons from flint, our modern lives are steeped in different but equally crucial social interactions. These interactions appear to be enabled, at least in part, by our impressive Theory of Mind (TOM) abilities. Although these abilities have been an extensive topic of research, most studies have focused on mental-state inference in relatively simple contexts, where participants must monitor another agent's changing beliefs over just a short period of time (e.g., the false belief task). Less research has investigated our abilities to track how others' beliefs change over longer, more complex interactions. Pedagogy provides an especially fruitful domain within which to study these abilities, and gain insight into how people reason about mental states in scenarios with rich temporal and interpersonal structures. **How do teachers infer what learners know, track changes to learners' knowledge over time, and utilize this information to decide what and how to teach?** Given my extensive research experience, I believe I am uniquely and ideally suited to investigate these questions as a first-year PhD student at Yale University.

INTELLECTUAL MERIT. My interest in cognitive development first sprang from my experiences supervising children in preschool and kindergarten classes. Early childhood is the time we engage in the *least* amount of structured education, yet the amount we learn during this period is unparalleled across the lifespan. How do children come into the world knowing so little, and learn so *much* over a few short years, especially in the absence of structured schooling?

In my first year as an undergraduate at UC Berkeley, I joined Dr. Alison Gopnik's Cognitive Development Lab as a research assistant working with then-graduate student Caren Walker. Drs. Gopnik and Walker were working on precisely those questions I had found so fascinating and important: how do children interact with, and thus learn from, the world around them? Can children discover and learn the world's causal structures through play and pretend – i.e., just by doing "kid things?" Inspired by the work being conducted in the lab exploring the relation between pretense (i.e., imaginative play) and counterfactual abilities (i.e., the ability to imagine alternatives to reality), I later pursued an honors thesis project under the mentorship of Drs. Gopnik and Walker. In pretense as in counterfactual reasoning, children must hold the *actual* world and the *counterfactual/pretend* world simultaneously in mind; therefore, we investigated whether engaging in pretense might prompt children to reason counterfactually. We manipulated whether or not children (3-5y) engaged in imaginary play about a toy with probabilistic outcomes, and examined whether children who engaged in pretense about the toy were better able to explicitly demonstrate their understanding of its probabilistic nature.

In the course of my extensive data collection activities, I interacted with and explained our research to hundreds of families. In addition, this project led me to secure an undergraduate research fellowship to fund my research, and present my results at several undergraduate conferences,[1, 2, 3] one of which resulted in a publication in a special issue of the Berkeley Undergraduate Journal.[4] These experiences **taught me how to frame science for the public** in an engaging, informative way. As a result of my honors thesis research I received highest honors in Psychology, and was awarded the Warner Brown Prize for excellence in research.

Upon graduation, I spent a year in Israel, working with Dr. Dana Shai at the Infant Studies Center at the Interdisciplinary Center Herzliya. There I assisted in collecting the prenatal time-point of a longitudinal study examining how parental Theory of Mind (TOM) affects later infant outcomes. Lower maternal TOM abilities correlate with less secure infant attachment, and

greater incidence of later child psychopathology. In Dr. Shai's lab, we further investigated the consequences of parental TOM abilities, in order to design interventions that might more effectively improve parents' abilities (thus impacting children's well-being in turn). Under Dr. Shai, I helped troubleshoot methods, run participants, and research tasks that could be integrated into the study in order to assess infants' nascent TOM, broadening my research interests.

After working with Dr. Shai for a year, I returned to UC Berkeley to work as Dr. Gopnik's lab manager. There, I coordinated multiple interdisciplinary studies investigating the nature of causal reasoning across development into adulthood, as well as children's free will beliefs.[5] I was involved in all aspects of this research, including data collection and analysis. During this time, I also gained a **deep appreciation for the interdisciplinary nature of cognitive science**. Dr. Gopnik's research is strongly influenced by insights from philosophy, biological anthropology, and computer science. Through collaborating with other researchers in the lab, and interacting with leaders in the field, I learned more about how building computational models of cognitive processes can help provide insights about the mind. And through Dr. Gopnik's collaborations investigating animal cognition, I became exposed to the ways in which cross-species comparisons can reveal the cognitive mechanisms underlying our own abilities. It became clear that, in conjunction with human behavioral research, computational and comparative approaches were important tools that could assist me in investigating the mechanisms and representations underlying humans' observable behaviors.

Currently, I am a graduate student at Yale University, co-advised by Drs. Julian Jara-Ettinger (PI: Computation and Development Lab) and Laurie Santos (PI: Comparative Cognition Lab). Because humans are one of the only species that explicitly teach their young, investigating the cognitive and representational capacities teaching species *share*, and those that non-teaching species *lack* can provide great insight into the roots of human abilities. Computational modeling can also assist in testing hypotheses about competencies required to successfully teach and learn from others, by revealing which capacities a modeled agent requires to approximate human performance. For example, if the performance of a model imbued with a particular subset of human capacities (i.e., an understanding of goals but not other things like intentions) approximates human performance, it is possible that humans solve the same task by reasoning only about goals, without engaging other abilities. More generally, if a model approximates human performance well in a variety of conditions, it is possible that its parameters and mechanisms approximate those of humans', providing avenues for further research.

While pedagogy is a particularly important *case* within which to investigate our "mind-reading" and representational capacities, as agents in the world, we must constantly infer, represent, and act upon the contents of others' minds. Thus, research into teachers*'* abilities should have important implications for our broader understanding of how our social abilities emerge, and the extent to which we rely on these abilities in our daily lives.

BROADER IMPACTS. Having benefited immensely from the supportive and intellectually stimulating environment these research experiences provided, **I have a deep commitment to paying these experiences forward, both in terms of mentorship, and in terms of outreach**. I have a strong history of service and volunteer work with underserved communities. As an undergraduate, I volunteered at several local schools, including Franklin Preschool (a Head Start preschool enrolling extremely underserved populations). And as Dr. Gopnik's lab manager, I helped manage research partnerships with four different Head Start centers in order to investigate whether students had learning deficits (compared to a high socioeconomic sample).

I also have extensive experience mentoring students. As an undergraduate, I mentored two female minority group students through the UC Berkeley Association of Psychology Undergraduates, and I am an active member of Women in Science at Yale as a mentor to undergraduate women in STEM. I have also mentored 12 undergraduate research assistants, most of whom were women from diverse populations underrepresented in STEM fields, with no previous research experience. In order to foster a deeper understanding of our work and the scientific process, we met bi-weekly to review and discuss current research papers.

In addition to these activities, **I am also committed to providing enrichment opportunities that might kindle a love for science in disadvantaged youth**. In order to pursue these goals, I joined the Community Resources for Science (CRS) and Bay Area Scientists in Schools (BASIS) programs. Both programs enable scientists to visit local schools (most of which are comprised of very underserved populations) in order to bring science to schoolchildren. I assisted at multiple science fairs at local schools, presented an in-class lesson about visual illusions and the brain, and attended afterschool events such as the Oakland Unified School District's "Dinner with a Scientist", where I answered questions and spoke about my research.

In order to further engage laypersons in science, throughout my research career I have pursued opportunities to **disseminate data to the broader community**. I was highly involved in disseminating the Gopnik Lab's findings to the general public, assisting Dr. Gopnik in preparing her talks, coordinating journalist's requests, writing and distributing our first ever lab newsletter, and explaining our research to thousands of families at partnered research sites. I helped maintain a National Living Laboratory relationship with the Bay Area Discovery Museum, and worked with museum personnel to spread our findings to an even wider community (for example, by coordinating the museum's first "Meet the Researchers Day"). Currently, I have joined the Yale Science Diplomats, and have been selected as a Yale Science in the News speaker. Speakers present an original talk about their research at events intended for local community members to attend (many of whom represent underserved communities).

One thing is incredibly clear: **cutting edge research does no good if it languishes in ivory towers**. If we do not work to implement policy changes informed by our research, we miss the opportunity to impact lives on a grander scale. My research proposal is designed with real-world implications in mind, and I look forward to disseminating and applying my results.

FUTURE GOALS. Because substantial gaps remain in our understanding of teaching, scientists are constrained in the kinds of policy recommendations we can offer. I aspire to work as a professor examining the mechanisms underlying teaching from an interdisciplinary perspective, leveraging insights from multiple fields in order to offer **comprehensive policy recommendations.** The expertise of my advisors and the ability to collaborate widely with other members of my department (such as Dr. Frank Keil, a noted science education researcher), provide the perfect interdisciplinary context to support these research questions. Becoming an NSF fellow will not only enable me to join and learn from a national community of scholars, but will also provide opportunities for broader international collaborations. Thus, becoming an NSF fellow will be a stepping-stone not only to producing higher impact research, but also to more effectively disseminating my results and translating findings into applied recommendations.

1) Aboody (2012). Talk presented at *Summer Undergraduate Research Fellowship Conference*. **2) Aboody** (2013). Poster, *Berkeley Interdisciplinary Research Conference*. **3) Aboody** (2013). Poster, *Calif Cog Sci Conference*. **4) Aboody** (2012). *Berkeley Undergraduate Journal, 25*(3), 4-11. **5)** Wente, Ting, **Aboody**, Kushnir & Gopnik (2016). *Proceedings of 38th Annual Cog Sci Society*.