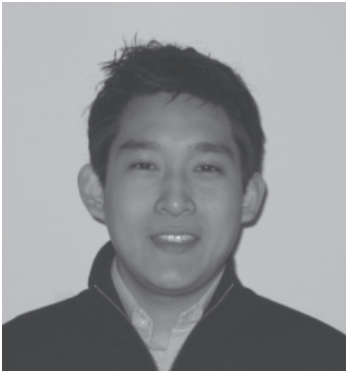


# undergraduate research spotlights

## Early Stages of Drug Discovery, Cellular Apoptosis, and Signal Pathways



**Name:** William Lin

**Division:** Biological Chemistry and Molecular Pharmacology, Harvard Medical School

**Thoughts:** “Forkhead transcription factors are involved in inducing apoptosis, or programmed cell death. In certain types of cancer (such as renal cell adenocarcinoma, melanoma, and breast, prostate, thyroid, and endometrial cancer), a kinase called PTEN in the PI3K/Akt signal transduction pathway is mutated or deficient. Functional PTEN localizes Forkhead transcription factors to the nucleus; in the mutagenic, cancerous state, Forkhead transcription factors are found in the cytoplasm. The hope is to find potent inhibitors of Forkhead transcription factor nuclear export so that these transcription factors are present in the nucleus and can induce apoptosis in the cancer cells.”

**Implications for:** development of anti-cancer therapeutics

## Malleability of Gender Stereotypes and Attitudes

**Name:** Beatriz MacDonald

**Division:** Psychology (Mind, Brain, and Behavior), Harvard University

**Topic:** Malleability of gender stereotypes, studied through the interplay between personality and situational context

**Thoughts:** “Temporary attitude constructions are formed not only in response to an immediate situation but also to the stable components that an individual brings across situations. For example, aggressive young adults bring to an ambiguous situation the readiness to see intentional affront. It was hypothesized that for aggressive males, both the situational context (the occurrence of an ambiguously hostile event) and personality factors (hostile attribution, perception, impulsivity, and expectation biases) would interact to magnify their implicit associations about gender in the workforce.”

**Method:** “Fifty-six male undergraduates completed a battery of tasks: pre- and post-Implicit Association Test (IAT; Greenwald *et al.*, 1998), Aggression Questionnaire (Buss & Perry, 1992), NEO Personality Inventory-Revised, and a manipulation task (Herrald & Tomaka, 2002). In the manipulation task, a female actress provided either ambiguously hostile or neutral feedback regarding the participant’s responses. Results indicated an interaction between type of feedback and aggression.”

**Findings:** “For aggressive males, gender attitudes were magnified in negativity after having a hostile interaction with a female ( $\Delta D = -.20$ , Std. Error =  $.08$ ) as compared to the attitudes of nonaggressive males ( $\Delta D = .14$ , Std. Error =  $.09$ ) ( $F(1,56) = 5.09$ ,  $p = .028$ ).”

**Implications for:** understanding and accounting for occupational sex segregation and the gender gap in earnings



credit: photographs taken by Scott Kominers, HSR; photograph of Virginia Borges supplied by the author.

# undergraduate research spotlights

## Understanding the Development of Prejudice in Children



**Name:** Virginia Borges

**Division:** Psychology, Harvard University

**Thoughts and Method:** “One of the most salient social groupings in children’s lives is gender, and, in my research, I examined children’s responses to the unequal treatment of other boys and girls. Elementary-aged children were randomly assigned to observe one gender being favored over the other, and were then given the opportunity to respond to this inequality by distributing resources to new children as they saw fit.”

**Surprise Finding:** “We found that children tended to favor their own gender. However, observed inequalities had an additional effect: children who observed females to be favored were more likely to distribute resources equally, while children who observed males favored were more likely to imitate, perpetuating the inequality.”

## Cholera Toxin Movement Through the Golgi Apparatus

**Name:** Joy Wan

**Division:** Gastroenterology, Children’s Hospital

**Thoughts:** “Cholera toxin (CT), produced by the bacterium *Vibrio cholerae*, is responsible for the massive secretory diarrhea that is associated with Asiatic cholera. In order to induce disease symptoms, the toxin first enters the intestinal host cell by binding to a specific receptor on the cell’s apical membrane, which is the surface of the cell that faces the lumen of the intestine. Once inside the cell, CT moves in a ‘retrograde’ pathway from the plasma membrane to the endoplasmic reticulum (ER), where a portion of the toxin dissociates into the cytosol. This portion then acts on its target protein and eventually induces disease. While CT must reach the ER to cause toxicity, the toxin has also been observed to move to the basolateral membrane (the surface opposite the apical membrane) of the host cell. This latter movement relies on a ‘transcytotic’ pathway about which little is known. Is this transcytotic pathway different from the retrograde pathway? Where does the toxin become sorted to either the ER or the basolateral membrane?”

**Hypothesis:** “Previous studies in my laboratory have suggested that the transcytotic pathway may include toxin movement through the Golgi apparatus and possibly other secretory compartments.”

**Method:** “Because sulfation of proteins occurs exclusively in the Golgi, I can see if the CT passes through the Golgi by using a mutant version of CT that is capable of being sulfated, along with selective cell surface labeling. Labeling allows me to specifically tag and isolate proteins on the basolateral surface. If the toxin arriving at the basolateral membrane is modified by radioactive sulfate, then this suggests that CT moves through the Golgi as it traverses the cell. If the toxin arriving at the basolateral membrane is not modified by radioactive sulfate, then CT does not move through the Golgi in the transcytotic pathway.”

**Implications for:** mapping cholera toxin routes in the cell

