

Student Research Profiles

### CHROMOSOME MUTATIONS COULD BE APRAXIA INDICATOR

The ability to speak comes so naturally to humans that the process seems automatic. Megan Bales, senior Pre-Medicine major, has studied a condition where this natural flow is disrupted.

Working with two Augustana professors, Bales studied apraxia of speech, a disorder that occurs when a person has trouble saying what he or she wants to say correctly and consistently.

A person with apraxic speech might struggle to find the correct word to use. He or she might want to say the word “boat” but be unable to remember what the word “boat” is. He or she might then run through a series of words, sometimes internally sometimes vocally, in attempt to find the right word.

This hesitation suggests that an apraxic speaker has a disconnection between the word the brain wants to say and the word that the voice produces. Yet at other times, this connection is there. This makes apraxic speech patterns unpredictable, distinguishing apraxia from other speech disorders, such as stuttering. However, since the patterns are not yet understood in detail, it is often difficult to diagnose.

“Research is one of my interests as it focuses on communities’ needs to make a difference in public health,” said Bales. Dr. Carol Maillet asked Bales to work with Nina Jansson and Dr. Kathy Jakielski of the Communication/Sciences Disorder Department on a joint research project to explore apraxia.

The study explored both genetic and speech pathology components. Jansson did the speech pathology work while Bales studied genetic and physical mutations.

Bales and her colleagues hoped to link chromosomal abnormalities to apraxia. Bales thought that doing so would provide a definitive blueprint for efficient diagnosis of the disorder.

The study focused on three children, all siblings who had physical and cognitive malformations, both positive signs for apraxia of speech. Bales analyzed the children’s genetic data from tests done at the University of Iowa. This information revealed a translocation on chromosomes 4 and 16 of the children. This type of mutation occurs when a piece of one chromosome is removed during DNA replication and relocated on another chromosome.

Bales used this evidence to hypothesize that a piece of the children’s father’s chromosome 4 was removed and moved to chromosome 16, resulting in two mutated chromosomes that were passed onto the children.

Bales then investigated these inherited chromosomes to determine specific genes that had been translocated. She played close attention to any genes that could explain the children’s physical malformations. She discovered that the Fox P2 gene and a few other genes were part of this specific mutation.

These results provided motivation to continue this kind of investigation on a much larger scale. If more subjects are found to have a mutation of the FoxP2 gene doctors can use the gene as a definitive positive indicator for apraxia of speech.

Because of this research, Bales was recognized as a member of Sigma Xi, national research fraternity. In the fall, Bales will be attending the Medical University of South Carolina for the Physician Assistant Program. “This will allow opportunities for not only practicing medicine,” Bales said, “but for research that can benefit communities at large.”

## THE ORPHEUM REMEMBERED

Local history is a valuable tool used by communities to make improvements while preserving the individuality and culture of a town. Beth Untz, junior History and Education major, will spend this summer investigating the history of the Orpheum Theatre, a local treasure in Galesburg Ill.

Working alongside Dr. Lendol Calder, Untz will search through archives to uncover information about the theatre. Built in 1916, the Orpheum, currently open today has been shut down, reopened, and renovated numerous times. Untz's job will be to discover exact dates and specifics about each renovation. She will also interview local Galesburg people to obtain a more personal oral history of the theatre.

Jennifer Rakestraw, Augustana alumna and the Orpheum's director, approached Calder about finding a student to help her uncover the theatre's historical evidence. Calder chose Untz at the recommendation of the History department who said she was a "once-in-a-decade student."

This type of project requires a student who is dependable, smart, motivated, and skilled in writing, all qualities Calder sees in Untz. "The opportunity to research and write such a book doesn't come along every day for an undergraduate student, nor could just any student be trusted to pull it off," Calder said.

Calder encouraged Untz to apply for one of Augustana's new student/faculty collaborative research grants. She received one of six grants awarded by Augustana, worth \$2,500. This will fund research costs, transportation, and stipends for both Untz and Calder.

The goal of the project is for Untz to compose a coffee-table type book about the theatre. Calder describes Galesburg as a town with a thriving, beautiful downtown, and the Orpheum as a foundation of the town's arts and entertainment scene. Therefore Calder expects there to be a great local interest in the book. However, interest will probably extend outside Galesburg as well. "These kinds of histories can tell us a lot about the history of how Americans have entertained themselves, how amusement has changed over time," said Calder.

Untz looks forward to working on this project with Rakestraw and Calder. "Being able to say that I have worked on writing a book to be published is great," said Untz. "When I go to get a teaching job, I will be able to say I have completed actual historical research."

Untz, inspired by a sixth grade history teacher, will complete her History and Education majors within the next year. She will then begin looking for a teaching job, she hopes in the Quad Cities.

## NEW STUDY EXAMINES DEPRESSION AND MARITAL SATISFACTION

In a society where somewhere near 40% of marriages end in divorce, Alanna Golden, senior psychology major, is doing her part to try to understand why.

Under the guidance of Dr. Larry McCallum, Professor of Psychology and Violet M. Jaeke Professor of Family Life, Golden is working to examine the relationship between depression and marital satisfaction.

A provider of marital therapy for many years, McCallum began this research project after noticing a unique relationship between depression and marital success. "There is increasing data in the literature that depression is related to marital satisfaction, but in a

complex way,” says McCallum. He believes this is a relationship that has not been investigated in sufficient depth.

With funding from the Jaeke Family Life Program, chaired by McCallum, Golden and her colleagues will study sixty couples. They will give each member of a couple a separate set of tests, which McCallum says will include a personality inventory, a standardized measure of depression, an assessment of nurturance and succorance, as well as a widely used test of marital satisfaction.

Golden says, “If we can identify variables that predict marital satisfaction, that would not only be a great finding in the field of psychology, but it would also be beneficial to increase the number of successful marriages.” McCallum believes that low levels of depression may either negatively or positively affect marital satisfaction. He feels the effect will depend on the specific needs of each partner. “If a woman who likes to be needed and take care of others is married to a very independent man, she might be happier if her husband was a bit depressed and needed her,” McCallum said.

Golden said she takes a personal interest in this kind of study. “It is interesting to learn the types of things that affect marital satisfaction. Depression, succorance, and personality variables to mention a few,” Golden said. “Even demographic variables like income, children, race, and religion have an effect. It’s surprising how much is actually involved.”

Golden hopes to do similar research in the future. Although she will not be at Augustana for the conclusion of the study, she plans to keep in contact with McCallum to keep up on how the project is going. “This is a really great opportunity to do real research and become more familiar with the method and all the work that goes into psychological studies,” says Golden. “This is very important to me, and I know it will help me prepare for things I will be doing in graduate school.”

Next year, Golden will be taking a year off from her education to do counseling work at Family Shelter Services in Wheaton, Ill. She hopes this research experience will help her when she applies to graduate schools on the west coast.

Thirteen other students are also working on this project: Beth Cloud, Valerie Lambert, Samantha Hoffman, Chelsea Karagianis, Gina Sammarco, Emily Lush, Erin Blanchard, Laura Kurczodyna, Jessica Moore, Melissa Cinquegrani, Krystle Waters, Erica Lee, and Gina Hodnik.

#### POLYGRAPH STUDY PRODUCES MIXED RESULTS

Augustana junior Blake Wilson is giving the “lie detector” a truth test of its own. Many people assume that the polygraph, popularly called a lie detector, is a dependable tool in criminal investigation. Wilson, a Pre-Medicine and Biology major, has developed an experiment to verify just how reliable it really is.

A polygraph is a device that detects the physiological changes that are believed to occur when a person lies. These changes include an increase in heartbeat, sweat accumulation on the palms, increased respiration, or a change in brain activity.

To measure change, a baseline must be set. According to Wilson, this baseline is established by asking a test subject questions that the investigator knows the true answers to. These are simple questions like name and hometown. After the baseline is established, any deviation from the line should indicate untruthfulness.

The idea behind a polygraph is that the machine measures changes that the subject cannot control. Wilson said that some professionals believe a person can manipulate a

polygraph test by establishing a higher baseline, such as by imagining things that make him or her nervous or uncomfortable while answering baseline questions. This increases physiological changes during the baseline, making them appear less drastic in further questioning.

This is why many professionals do not consider polygraph results credible. This is also the problem that Wilson wanted to investigate. "I knew polygraph testing never stood up in the court of law," Wilson said. "I wanted to come up with a way to examine how accurate polygraphs really are."

There were challenges involved in this process, however. "The real problem was devising a test to force subjects to lie in a predictable manner," Wilson said. To get around this issue, Wilson developed a repeatable test that could be used with many subjects, where he controlled the answers.

Using space and resources provided by Dr. Shaw, Assistant Professor of Biology, Wilson began the test by having a person fill out a survey. He then attached polygraph sensors to the wrists and ankles of the subject and, based on the answers to the survey, asked questions that would have to be answered truthfully.

For the second part of his experiment, Wilson created a negative basis test. "The subjects would pick a card, but it was unknown to them that I knew what card it was," Wilson said. "I then told them that they had to answer no to every question I asked them about the card." Wilson asked 5 questions, arranged so the subject would be lying on questions 3 and 5.

The results of the experiment were mixed. Wilson got a standard error of .33 for question 3 and .07 for question 5. A deviation of .05 is considered statistically significant. "I didn't get as good of a spread as I wanted to," Wilson said. "However, question 5 was very close to being significant."

Wilson is not losing hope yet, however. "I'm hoping to take this test to a new level next year," Wilson said. "What I really want to investigate is if Beta wave activity in the brain is different in subjects who are lying and who are telling the truth." He feels brain activity will provide a more definitive answer about the quality of polygraph results.

Wilson will be presenting this experiment in the Celebration of Learning on May 12, 2005.