Scholarly research and creative endeavors are essential components of higher education. James Madison University (JMU) strongly supports undergraduate research. Allowing undergraduate students to be involved in in-depth faculty-mentored research offers students the invaluable opportunity to become familiar with the investigative process and sharpen the specific area of interest of the student. Encouraging undergraduates to become involved in research projects has another more personal advantage for students; the experience allows students to learn early on what research is about and whether they like the work, enabling the student to make career decisions prior to committing to a research graduate program.

The National Conference for Undergraduate Research (NCUR) is seen as the premier event for showcasing undergraduate research in the United States. Seeking to promote research, scholarship, and creative endeavors since its inception in 1987, NCUR has become a major annual event. JMU has sponsored 322 representatives to the conference since 1989. Attendance at NCUR presents an opportunity to hear nationally prominent speakers including a conceptual artist, a noted chemist, and an acclaimed author.

This year 19 JMU students joined over 2,000 undergraduates, faculty, and administrators from 282 colleges and universities around the country at the University of North Carolina–Asheville to participate in NCUR. The JMU NCUR presenters represented seven disciplines and three colleges of the university. Disciplines represented included Biology, Physics, Chemistry, Kinesiology, Psychology, Political Science, and Integrated Science and Technology.

The mission of NCUR is to promote undergraduate research scholarship and creative activity in partnership with faculty and other mentors as a vital component of higher learning. Integrating research into the curriculum is a growing practice in American universities and is being further supported financially by federal research agencies. The annual conference creates a unique environment for the celebration and promotion of undergraduate student achievement as it exists in various disciplines and types of institutions. Attendees at the conference were able to hear and discuss undergraduate research work by means of oral presentations, interdisciplinary poster sessions, and artistic performances and visual arts exhibits.

Chemistry Professor Daniel Downey, ISAT Professor Ronald Raab, Biology Professors Kyle Seifert and David Jaynes, and Undergraduate Research Coordinator Pat Buennemeyer accompanied the JMU students to Asheville, North Carolina for the conference, which took place from April 5 through April 8. Read on to learn more about the summaries of our undergraduates’ research accomplishments.

For details on other aspects of sponsored programs, please contact: Patricia Buennemeyer
Office of Sponsored Programs
JMABldg. 6, Suite 26
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DETERMINATION OF THE COEFFICIENT OF NEGATIVE THERMAL EXPANSION OF ZrM2O8 (M = Mo, W)
Nicole A. Brehm (Dr. Barbara A. Reisner), Department of Chemistry

An exercise for the physical and materials chemistry laboratory that will enable students to investigate how changing the temperature can induce changes in cell constants and phase transitions has been developed. ZrM2O8 (M = Mo, W) were synthesized by precipitating a precursor material from solution and heating a solid state mixture. Measurements with a differential scanning calorimeter (DSC) and powder X-ray diffractometer were used to determine the enthalpy change of the solid-solid phase transition and the negative thermal expansion of ZrM2O8. Successful collection of cell constants and phase transition data was made and characteristics of negative thermal expansion of the materials were observed.

PRODUCTION OF POLARIZED SCINTILLATING TARGETS FOR USE IN NUCLEAR PHYSICS
Joseph L. Blankenburg and Ronald J. Bartolo II (Dr. C. Steven Whisnant), Department of Physics

B. van den Brant, E.I. Bunyatova and J.A. Konter pioneered the method for producing polarized scintillating targets/detectors at the Paul Scherrer Institute in Switzerland. We are trying to reproduce the method and work out the ambiguous details in their paper. Having studied their properties, we plan to give a brief explanation of how they work and how they are produced. The characteristics of polarizability, clarity, and scintillation efficiency are important for the targets to be used successfully. We will discuss how certain variations in the process affect these characteristics. The goal of the research is to produce targets with these characteristics, such that Compton scattering and threshold pion photo-production can be studied. The use of these targets will allow lower energies to be used for studying pion photoproduction and an elimination of the background radiation at the High Intensity Gamma Source (HIGS) facility at Duke University. We will conclude with a discussion of future goals and a summary of our results.

CLONING AND EXPRESSION OF THE HYPOTHETICAL GBBA GENE OF Bacillus Anthracis FOR THE DEVELOPMENT OF A RECOMBINANT PROTEIN VACCINATION
Zach Bradley (Dr. Ronald W. Rabb), Department of Integrated Science and Technology, and (Dr. Susan Welkos), United States Army Medical Research Institute for Infectious Diseases

Bioterrorism is a threat in the world of today. Anthrax (Bacillus Anthracis) has already been used in attacks on American soil, and remains a Class A biological agent according to the DOD and the CDC. Although there is currently a vaccine available for Anthrax, the United States Army Medical Research Institute for Infectious Diseases (USAMRIID) is researching other possible vaccine candidates, that may prove more effective, and easier to administer. The GBAA gene of anthrax is a hypothetical gene that has been identified in the Bacillus Anthracis genome. Using recombinant DNA technology and the IMPACT-CN system of New England Biolabs, the GBAA gene was cloned, expressed, and purified. The end product of the research included a purified fragment of GBAA (soluble) and the full length GBAA protein as an insoluble inclusion body. The two end products were sent to USAMRIID for further analysis, and will be tested in animal models for specific antibody production as part of an immune response.

DETERMINATION OF THE COEFFICIENT OF NEGATIVE THERMAL EXPANSION OF ZrM2O8 (M = Mo, W)
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An exercise for the physical and materials chemistry laboratory that will enable students to investigate how changing the temperature can induce changes in cell constants and phase transitions has been developed. ZrM2O8 (M = Mo, W) were synthesized by precipitating a precursor material from solution and heating a solid state mixture. Measurements with a differential scanning calorimeter (DSC) and powder X-ray diffractometer were used to determine the enthalpy change of the solid-solid phase transition and the negative thermal expansion of ZrM2O8. Successful collection of cell constants and phase transition data was made and characteristics of negative thermal expansion of the materials were observed.
SYNTHESIS OF 3-METHYL-3-PENTYLCYCLOBUTENE: INITIAL ATTEMPTS TO CAPTURE A FLUOROCYCLOPENTADIENE ON THE PATHWAY TO 1,3-DIFLUOROBENZENES

Michelle B. Curtis, (Dr. Scott B. Lewis), Department of Chemistry

One of the key intermediates in the proposed mechanism to form 1,3-difluorobenzenes from substituted cyclobutenes with difluorocarbene is believed to be a fluorocyclopentadiene. To date, this intermediate has proven to be too fast kinetically to catch and characterize. Rather than try to catch the intermediate on its way to a 1,3-difluorobenzene, controlling the reactivity of the intermediate is feasible. An appropriately substituted cyclobutene should allow the fluorocyclopentadiene to be captured and characterized. This paper discusses the synthesis of 3-methyl-3-pentylcyclobutene, and its reactions with difluorocarbene.

THE ROLE OF DISPOSITIONAL FORGIVENESS IN PREDICTING COLLEGE STUDENTS’ ATTITUDES TOWARDS THE PUNISHMENT OF OFFENDERS

J. Philip Erb Jr., (Dr. Sherry L. Serdikoff), Department of Psychology

The current criminal justice system is dominated by the retributive justice paradigm. In recent years proponents of the restorative justice model have suggested that adding policies and procedures that embrace their ideals would provide more efficacious and judicious outcomes. This study examines the relation between personality and situational factors that influence college students’ attitudes towards the inclusion of restorative and retributive options when sentencing criminal offenders. Specifically, undergraduate college students complete a questionnaire packet that includes a measure of dispositional forgiveness, crime scenarios followed by ratings of sentencing options, and questions designed to gather demographic information. The relation between an individual’s dispositional forgiveness and their rating of the sentencing options is explored in the context of scenarios describing crimes of differing severities. The data help us to understand how these factors act individually and in concert to affect such decisions and have implications for potential implementation of restorative justice components into the current criminal justice system.

THE ROLE OF INSTRUCTIONS AND SELF-GENERATED RULES ON COLLEGE STUDENTS’ PERFORMANCE ON A PROBABILITY MATCHING

Andrew D. Hucks, (Dr. Sherry L. Serdikoff), Department of Psychology

The present study examines probability matching, a type of non-optimal performance that occurs in certain choice situations. The extent to which probability matching is the result of self-generated rules consistent with a lifetime’s history of seeking errorless performance on similar tasks is explored. Undergraduate students are presented with four 160-trial sessions of a repeated binary choice procedure where one alternative is reinforced on 75% of the trials and the other is reinforced on the remaining 25% of the trials. Each session is identical except for specific instructions given at the beginning: (1) no instructions (2) “The red circle will be correct 75% of the time and the blue circle will be correct the remaining 25% of the time” (3) “Obtaining 75% of the available points is considered a perfect score,” and (4) “Points will be available on only 75% of the trials.” Data show that the first three conditions tend to produce non-optimal responding consistent with probability matching. The extent to which the fourth condition leads to self-generated rules that allow individuals to achieve optimal performance is discussed.
THE USE OF GREEN FLOURESCENT PROTEIN TO CREATE EXPRESSION PLASMIDS FOR TWO SALVAGE PATHWAY ENZYMES

Adaku F. Iwueze (Dr. Judith A. Wubah and Dr. Daniel A. Wubah), Department of Biology

In the United States, 4 million babies are born each year and approximately 150,000 of these are affected by congenital malformations. It is not known whether the 4,000 neonates born each year that suffer from mitochondrial DNA defects are included in this number. The mitochondrion, which is the energy generator in the cell, functions in other metabolic processes. Deoxyguanosine kinase (dGK) and thymidine kinase2 (TK2) are nuclear genes, which encode the rate-limiting enzymes in the mitochondrial salvage pathway, a process for generating deoxynucleotide triphosphates. Mutations in dGK and TK2 lead to various forms of mtDNA depletion syndrome and early infantile deaths. A novel isoform of dGK, dGK3 and TK2 are being analyzed with a long-term goal to determine their possible role in birth defects. The objective of this study is to create expression plasmids of dGK3 and TK2 which will be used to determine the intracellular location of these two genes. Using total RNA from adult mouse liver, full-length dGK3 and TK2 complementary DNA (cDNA) were amplified which contained EcoR1 sites at both ends. The cDNA products were each cloned into pGEM-T vector and digested with EcoR1 enzyme to ensure incorporation of the sites. The digested products were ligated with a digested pEGFP vector. Screening of several clones has yielded an expression plasmid for dGK3 and three possible expression plasmids for TK2. The generated TK2-GFP expression plasmids will be sequenced for confirmation. In summary, GFP expression plasmids will be confirmed by sequencing and used in future transfection studies.

THE RELATIONSHIP BETWEEN THE ECONOMIC STATUS OF COUNTRIES AND THEIR EFFORTS TO PREVENT HUMAN TRAFFICKING

My-Lien Le (Dr. Gary Kirk) Department of Political Science

As an issue of public policy, the United States government opposes prostitution and any related activities that contribute to the trafficking of persons. Demonstrating this commitment, the U.S. passed the Trafficking Victims Protection Act of 2000 (TVPA) which threatens suspension of non-humanitarian aid for countries that fail to make progress. Despite these efforts, the trafficking of women and children for sexually exploitive purposes continues to be a growing transnational crime. This paper hypothesizes that a nation’s economic condition and its level of effort in reducing human trafficking are related. Using gross national income per capita (GNI/capita) as a measure of economic status, data were collected for 195 nations for the years 2001 through 2004. Tier rankings, determined by the U.S. Department of State, were used as an estimate of each country’s human trafficking prevention effort for each year. With the tier ranking as the dependent variable, there was a moderate association between the two variables (Somer’s d=-.299). The relationship between these variables was found to be statistically significant using a chi square test (chi-square = 141.1, df = 6, p<.001). The results indicated that 79.5% countries that were ranked as having made substantial efforts to reduce trafficking (Tier 1) were in the highest quartile of GNI/capita; however, among non-compliant countries (Tier 3) cases were more equally distributed between GNI/capita quartiles. This pattern may indicate that socio-cultural issues are more important than economic factors in some countries. These preliminary results confirm the need for further research that accounts for additional explanatory factors. As well, a reliable source for statistics on human trafficking and GNI estimates for poor countries would improve this line of study.
PERCEIVED INTERACTION BETWEEN PEERS AND FAMILY AND ITS RELATIONSHIPS TO ACADEMIC ACHIEVEMENTS AND SOCIAL NETWORKS IN COLLEGE

Jessica L. Major (Dr. Monica J. Reis-Bergan)
Department of Psychology

College students today are from a new generation that involves working mothers and fathers as well as blended and single parent families. This new generation has been subject to different social development than the generations prior. Research suggests that children model their parents’ behavior in tangible ways; one example is smoking and drinking alcohol. However, the present research aims to study the relationships between social skills of adolescents, and their perception of their parents’ social skills. It will also compare the social networks to the adolescents perceived social skills to see if their development has been affected by their parents’ social skills. Through surveying many first year students at a major university the study will examine the relationship between their social skills, their parents’ social skills, their perceived social self efficacy, and their academic achievement. It is expected that there will be a significant interaction between the social self efficacy and the parents’ and adolescents’ social skills, as well as a significant interaction between the adolescents’ perceived social skills and actual academic achievement.

ACADEMIC PERFORMANCE AND SATISFACTION WITH INTERTEACHING: DO LEVEL OF ACHIEVEMENT MOTIVATION AND GENDER PLAY A ROLE?

Elizabeth A. McGee (Dr. Tracy E. Zinn),
Department of Psychology

Individuals differ greatly in the degree to which they strive for success. For example, one person may like challenges and competition whereas another person avoids difficult tasks. The achievement motive, which describes an individuals’ drive to succeed, helps to explain these differences in individual preference (Atkinson & Feather, 1966). We can apply this motive to all areas of life, including academic performance. The purpose of the present research was to examine the relationships between students’ level of achievement motivation, gender, and academic performance. Specifically, the study investigated gender differences in levels of achievement motivation from students in several psychology courses at James Madison University. Furthermore, this study evaluated levels of achievement motivation and students’ success in and satisfaction with interteaching, a behavioral teaching method that requires cooperation. We hypothesize that women will enjoy the cooperative teaching method more than men and that, although those with high achievement motivation will perform well with the interteaching method, they will enjoy it less than those with low achievement motivation.

Karolina Roszak and Jamie Munnis with the UNC-Asheville Bull Dog.

JMU students enjoying their box lunches.
THE RELATIONSHIP BETWEEN MUSCULAR STRENGTH AND BONE MINERAL DENSITY IN ADULT FEMALES

Jamie K. Munnis (Dr. Judith A. Flohr), Department of Kinesiology

Lower body muscular strength will be tested by a 5RM on the leg press. Bone mineral density will be determined by using dual-energy x-ray absorptiometry (DEXA). The participants will have a DEXA scan performed on their right and left hips and lumbar spine. A correlation analysis will be performed to determine if a relationship exists between upper and lower body muscular strength and bone mineral density. A t-test will be used to determine if any significant differences exist. From this, the public may be informed of whether or not resistance training (which increases muscular strength) may have an effect on the development of osteoporosis.

After menopause, women experience a decrease in estrogen levels, which leads to a decrease in bone mineral density and therefore increases the risk of osteoporosis. If it is found that there is a significant relationship between muscular strength and BMD, post-menopausal women can potentially decrease their risks of developing osteoporosis by increasing their muscular strength.

INSTALLATION OF THE MULAN CALIBRATION SYSTEM

Matt Miller (Dr. Kevin L. Giovanetti), Department of Physics

The purpose of the MULAN project is to measure the muon decay rate to an accuracy of better than one PPM and use this data to calculate the Fermi constant. To do this a target is placed in the muon beam of Paul Scherrer Institute of Villigen, Switzerland. Decays are detected via photomultiplier tubes. Members of the JMU physics department built the calibration system. This system utilizes LEDs to simulate an event in scintillation detectors complete data run. Installation began in the summer of 2004 and was completed by August of 2005. After the full installation was successful, further tests demonstrated the viability of the system. The detector is now capable of being fully calibrated.

THE RELATIONSHIP BETWEEN MUSCULAR STRENGTH AND BONE MINERAL DENSITY IN ADULT FEMALES

Jamie K. Munnis (Dr. Judith A. Flohr), Department of Kinesiology

Having low bone mineral density (BMD) can lead to life altering changes – namely, the development of osteoporosis. Previous research indicates that, as much as 80% of the individuals with low BMD are women. Previous studies indicate that being physically active throughout one’s life may decrease one’s chance of having low BMD, and therefore decrease the chance of developing osteoporosis. The purpose of this study is to look at upper and lower body muscular strength and bone mineral density and determine whether or not a relationship exists between the variables. The participants of this study will be post-menopausal women between the ages of 50 and 75 who were vigorously active during their college years (average 18-22 years) and volunteered to be a part of this study. The participants will have their upper body muscular strength tested using a five-repetition maximum (5RM) on the chest press.
CLONING, EXPRESSION, AND PURIFICATION OF SERINE-RICH REPEAT PROTEINS OF THE NEONATAL PATHOGEN GROUP B STREPTOCOCCUS FOR DETERMINATION OF GLYCOSYLATION PATTERNS

Allyson L. Samselski, Amanda J. Billings, Paul R. Watson (Dr. Kyle Seifert), Department of Biology

Group B streptococci are a leading cause of neonatal pneumonia, sepsis, and meningitis, as well as pathogens of adults with underlying health conditions. Although all 9 serotypes have been isolated from infected individuals, serotype III organisms account for greater than 90% of all meningitis cases. Serotype III organisms can be further divided based on genetic techniques, which separates these organisms into 4 groups. One of these subgroups causes over 90% of all cases of GBS disease caused by serotype III organisms. Genetic analysis has determined that this more pathogenic, or “hypervirulent” lineage, has a unique surface serine-rich repeat glycoprotein (Srr-2) that is different than a similar glycoprotein (Srr-1) that is found in the less pathogenic strains. This project focuses on determining differences in glycosylation between the two serine-rich repeat glycoproteins. The serine-rich repeat proteins have been PCR-amplified, cloned, and expressed in E. coli. Amino-terminal fragments have also been cloned and expressed. Expressed proteins are soluble, and purified proteins will be used as immunogens in rabbits to produce polyclonal antibodies so that the native glycoproteins can be purified and analyzed for carbohydrate content.

SYNTHETIC PROGRESS TOWARDS A TEMPLATE ASSISTED SYNTHETIC PROTEIN

Karolina Z. Roszak, Ashleigh R. Borges, Christian D. Zeigler (Dr. Kevin P.C. Minbiole and Dr. Kevin L. Caran), Department of Chemistry

Molecular scaffolds are molecules that provide functional groups as points of attachment to chemical groups or biologically significant moieties. A rigid scaffold can serve as a molecular core that holds its substituents in defined orientations in space. The relative positioning of these functional groups can have a profound effect on the aggregation, self-assembly, binding ability of the molecules. Derivatives of these scaffolds bearing small peptides may also be utilized as enzyme mimics where the enforced juxtaposition of amino acid chains provides a binding pocket that imitates the active site of an enzyme. Currently, we are in the process of synthesizing two stereoisomeric molecular scaffolds based on a C3-symmetrical, conformationally-fixed trans-trans-trans fused perhydrophenalene system. The synthesis of the molecular scaffold will be accomplished by a triple ring-opening-ring-closing metathesis starting with cyclobutanone. Presently, we are undertaking a model study using cyclohexanone. Progress on our synthetic efforts will be reported.

HIERARCHICAL INFORMATION PROCESSING IN DYSLEXIA: VISUAL PERSISTENCE AND PROCESSING SPEED OF LOCAL AND GLOBAL STIMULI

Rebecca B. Oliver (Dr. Jeffery T. Andre ), Department of Psychology

The purpose of this investigation is to test whether adults who have been diagnosed with a specific reading disability, that is dyslexia, will perform differently than adults with normal reading capabilities on tasks of visual processing. Previous research suggests that the dyslexic visual system may take an unusually long period of time to recover from the aftereffects of neural activity caused by a stimulus and is therefore, less able to process information in sequence. Accordingly, two tasks will be employed to test the initial stages in visual processing. One task, temporal integration, will assess lengths of visible persistence. Another task, backward masking, will evaluate speeds of processing. Both tasks will be carried out under conditions that test the processing of global and local information. These tasks will involve the rapid presentation of stimuli on a computer screen followed by discrete measure of local or global discrimination success. Continuous dependent variables that will be measured are reaction time and accuracy. It is hypothesized that dyslexics will perform worse than normal readers under all conditions that pertain to local information processing but that their performance will not significantly differ under conditions involving global processing.

CLONING, EXPRESSION, AND PURIFICATION OF SERINE-RICH REPEAT PROTEINS OF THE NEONATAL PATHOGEN GROUP B STREPTOCOCCUS FOR DETERMINATION OF GLYCOSYLATION PATTERNS

Rebecca B. Oliver (Dr. Jeffery T. Andre ), Department of Psychology

Organisms. Genetic analysis has determined that this more pathogenic, or “hypervirulent” lineage, has a unique surface serine-rich repeat glycoprotein (Srr-2) that is different than a similar glycoprotein (Srr-1) that is found in the less pathogenic strains. This project focuses on determining differences in glycosylation between the two serine-rich repeat glycoproteins. The serine-rich repeat proteins have been PCR-amplified, cloned, and expressed in E. coli. Amino-terminal fragments have also been cloned and expressed. Expressed proteins are soluble, and purified proteins will be used as immunogens in rabbits to produce polyclonal antibodies so that the native glycoproteins can be purified and analyzed for carbohydrate content.
SUCCESS OF LIMING A SINKING STREAM VERSUS A PERENNIAL SURFACE STREAM

Holly M. Tuck, Carla R. Landes, (Dr. Daniel M. Downey), Department of Chemistry

Mountain Run is located in the George Washington National Forest, part of the Massanutten Mountain Range of Virginia. Brook trout and other species suffered severe losses in the 1980’s due to atmospheric acid injection (acid rain). Mountain Run was treated with limestone to restore water quality initially at a location in a lower reach that flows perennially and later in an upper reach that experiences several sinks into the soil. Water quality parameters (WQP) were analyzed and fish inventories were taken from 1992 until present time. Key WQP values were as follows for four locations: upstream of the perennial site, 1.25 km downstream of the perennial site, upstream of the sinking site and 1.25 km downstream of the sinking site. Average values found were pH = 4.64, 5.73, 4.59, 5.05; ANC = -22.2, 20.1, -28.2, -6.9 (μeq/L); Ca:H = 1.3, 265.1, 0.87, 9.0; Al= 303, 108, 409, 184 (ppb). The only location that accommodates trout is the area 1.25 km downstream of the lower reach with a perennial flow. This study compares the effectiveness of liming Mountain Run in the two locations, and how the response from the upper reach is less efficient due to the sinks in the stream and the acidic nature of the soil.
James Madison University
Application Procedure:

Students are selected to attend the National Conference on Undergraduate Research and represent the institution by a committee composed of JMU faculty and administrators. For consideration to participate and represent JMU at this national event, students must fully complete and submit an application adhering to all deadlines.

The application packet includes the JMU Student Application and the Faculty Advisor Form. The student must complete the JMU Student Application and return it, along with a copy of the abstract, on paper and in electronic format to the Office of Sponsored Programs, JMAC-6, Suite 26, by no later than 12:00 p.m. Friday, October 27, 2006.

Meeting this deadline enables the NCUR Selection Committee to review the applications and select students to represent JMU. Those candidates selected by JMU must then register with NCUR in time for the NCUR registration deadline.

The three-part applications may be obtained at the Office of Sponsored Programs or from the Web at the following URL: http://www.jmu.edu/sponsprog/ncur.html

- The application packet has the following elements:
  1. NCUR Application Checklist
  2. Student Application (Including Abstract Information)
  3. Faculty Advisor Form (Letter of Support)

- Print and complete the JMU online Student Application
- Submit
  1. The signed original application along with a copy of your research abstract
  2. An electronic copy (on disk) of your abstract
     - to the Office of Sponsored Programs (OSP)
     - by NOON on Friday, October 27, 2006.

REMINDEERS:

- The ENTIRE application form must be typed.
- ALL required signatures must be obtained prior to submission to OSP.
- Abstracts MUST be submitted on paper and on disk.

Note:
Faculty advisors must complete the Faculty Advisor Form and return it separately to the OSP by Friday, October 27, 2006.
Congratulations to the participants of the 2006 NCUR Conference!

Joseph Blankenburg  
Zach Bradley  
Nicole Brehm  
Michelle Curtis  
Philip Erb  
Andrew Hucks  
Adaka Iwueze  
Jessica Major  
Elizabeth McGee  

Mike McGrath  
Matt Miller  
Jamie Munnis  
Rebecca Oliver  
Karolina Roszak  
Allyson Samselski  
John Telfeyan  
Brent Toland  
Holly Tuck

Karolina Roszak, Mike McGrath, Jamie Munnis and Brent Toland celebrating after their presentations.

Psychology participants.

Dr. Downey and Holly Tuck at the 20th NCUR.

Chemistry participants.