



Minot State
UNIVERSITY

2012 Faculty and Students
Research Poster Session
April 24, 2012
Book of Abstracts



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*The Annual Research Poster Session and Book of Abstracts is sponsored by the
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2012 MSU Research Poster Session – Book of Abstracts

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Determinants of Binge-Drinking Behavior using the Theory of Planned Behavior and External Factors such as Older Siblings and Parents

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The purpose of this study was to investigate several variables as possible determinants of adolescent binge drinking behavior and the amount of alcohol usually consumed. These variables were the cognitive determinants of the Theory of Planned Behavior with reference to adolescent alcohol use, as well as risk factors and protective factors represented by the external variables of older siblings and parents. Self-report questionnaires were filled in by a sample of 127 adolescent students from a Midwestern College in the U.S. A considerably high frequency of binge drinking and large amounts of consumed alcohol among adolescents was observed. Bivariate correlation analyses indicated significant associations between the variables of the TPB and the sibling and parent factors for adolescent alcohol use. Simultaneous regression analyses conducted in view of adolescents' drinking habits (e.g. number of drinks consumed) revealed a comparable predictive power of siblings' and parental alcohol use. The results of this study emphasized the relevance of external social factors in the context of adolescent drinking behavior. These findings suggested that parental and older siblings' factors should be taken into consideration in regard to preventive interventions focused on the reduction of adolescent alcohol use.

Funded by Minot State University Mini-Research Grant

The Role of Immune-Mediated Activation and Interactions in Breast Cancer Progression

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The tumor immunosurveillance theory suggests that various components of the immune system constantly survey the body for nascent tumors and respond by eliminating most of them and possibly slowing the growth of others. Four types of immune cells – Cytotoxic T lymphocytes (CTLs), macrophages, Natural Killer (NK) and helper T cells – play the most significant roles in developing breast cancer immunity. Each of these immune cell types directly recognizes and kills the cancer cells. This study developed and explored a mathematical model that addressed the immune system's role in combating breast cancer. In particular, the model focused on the extent to which stimulatory mechanisms used by macrophages, NK and helper T cells to induce CTL activity impacts cancer growth dynamics. The model was analyzed numerically. Results supported proposed theories that maximal breast cancer immunity depends on each of the four immune cell types working together. In addition, the model predicted conditions under which several dynamical behaviors, including exponential breast cancer growth or decay. These results may provide testable predictions of breast cancer growth dynamics occurring at sizes that are usually not clinically detectable.

Modeling HIV/AIDS Epidemic in the Oil-Rich Niger Delta in Nigeria

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Nigeria is one of the countries most affected by the HIV/AIDS pandemic, third only to India and South Africa. With about 10% of the global HIV/AIDS cases estimated to be in the country, the public health and socio-economic implications are enormous. This project examined the evolution of the HIV epidemic in the Oil-rich Niger Delta. HIV prevalence in the Niger Delta of Nigeria is generally attributed to concurrent sexual partnerships and weak public sector health care and education systems. Current survey data and data produced by mathematical models are analyzed. Models provide an important role in understanding and estimating HIV variables that are difficult to measure. Through the models we address questions concerning the epidemiological and evolutionary future of the HIV epidemic in the Niger Delta. Our study suggested that (1) the epidemic is distributed differently between groups, (2) the infections may decline or level off due to the saturation of the at risk people, even if other preventive programs are not implemented, (3) the findings suggested that selection of model parameter values should be made with caution since they may mislead the society on the view of the spread of the HIV epidemic, and (4) to stop the further spread of HIV in the region, efforts to address poverty, sex work, and multiple sexual partnerships should be intensified.

Rapid synthesis of N-(2,4-dichlorobenzyl)formamide

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Background and Objective. Substituted benzylamines are important intermediates in the synthesis of numerous biologically active compounds. They can be obtained from the respective substituted benzaldehydes via the intermediate substituted benzylformamides. Recently, we developed an accelerated procedure for the synthesis of formamides. It was important to investigate if the procedure can be successfully applied for the synthesis of benzylformamides with electron-withdrawing substituents, for example N-(2,4-dichlorobenzyl)formamide.

Methods. The reaction was conducted on 10 mmol scale at 191°C. Column chromatography was used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structure of the products.

Results. The reaction was fully completed in 1 minute and produced N-(2,4-dichlorobenzyl)-formamide in good yield. Three byproducts were isolated and their structures were determined.

Conclusion. The first rapid synthesis of N-(2,4-dichlorobenzyl)formamide has been developed. The new reaction opens the way for the fast synthesis of N-(2,4-dichlorobenzyl)amine and its derivatives in the laboratory practice and industry.

The project is supported by NIH grant P20 RR016741 from the NCRR

Testing Lactoferrin for Allosteric Disulfide Bonds

Joshua Beaudoin and Bryan Schmidt, Ph.D.

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The purpose of this research is to take bovine colostrum (foremilk from a cow) and extract pure lactoferrin from it using a FPLC (Fast protein liquid chromatography). This pure lactoferrin will then be taken and added to LB (Lurea bertani) and YEPD (yeast extract peptone dextrose) agar plates in the liquid stage of agar plate making. This will allow lactoferrin to be in the yeast and bacteria growth substrate. Yeast YW3522 and bacteria JM109 will be added to their respective YEPD and LB plates via standard techniques. This will result in an inhibition zone that will confirm previous research which indicates that lactoferrin is bacteriostatic and fungistatic. We will chemically modify the cysteine residues of lactoferrin to prevent disulfide bond formation and repeat the microbial growth tests to determine if the disulfide bonds of lactoferrin have any effect on the antimicrobial activity of this medically important protein.

This research was funded by an MSU Small Research Grant.

Cluttering & Stuttering: Perceptions of Undergraduate Communication Disorders Students

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Attitudes toward speech disorders are important to the speech language pathologist's work and can be a barrier to client progress. Knowledge, attitudes, and acceptance are the tools through which people who stutter or clutter come to grips with their disorder and move forward in the recovery process.

Negative attitudes toward stuttering are well documented across the globe. Speech language pathologists and students of communication disorders are among those with negative attitudes. Cluttering is less well understood. There is little research examining attitudes toward cluttering. Two recent studies indicate a possible shift in attitude toward fluency disorders.

This study examined the attitudes of students with declared majors in communication disorders toward cluttering and stuttering. Students from two Northern Border Universities participated by completing a survey rating bi-polar personality traits of either a hypothesized person who clutters or stutters.

Findings indicated that students of communication disorders tended to rate people who clutter or stutter similarly and positively on all but one personality trait, emotional adjustment. Overall, students rated people who clutter more negatively than those who stutter. Student attitudes became more positive from freshman to seniors. No significant differences were found.

Results of this study support the possibility of a shift in student attitudes and suggest uniformity in attitudes toward both fluency disorders.

This work was supported by a Minot State University Faculty Research Grant.

Byproducts in the Rapid Synthesis of N-vanillylformamide

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Background and Objective. Vanillylamine is an important intermediate in the synthesis of medicinally active compounds, for example, capsaicin. Vanillylamine can be synthesized from vanillin by the Leuckart reaction via the intermediate N-vanillylformamide. Recently, we developed an accelerated procedure for the synthesis of formamides and successfully applied it to vanillin. The reaction was completed in 1 to 3 minutes and produced N-vanillylformamide in good yield. In this work, the newly developed reaction was investigated for the purpose of isolation and investigation of the reaction by-products.

Methods. The reaction was conducted on 10 mmol scale at 188°C. Column chromatography was used for the isolation of the products of the reaction. NMR-spectroscopy and elemental analysis were used to determine the structure of the products.

Results. The reaction was completed instantaneously and produced N-(4-hydroxy-3-methoxybenzyl)formamide in good yield. Three byproducts were isolated and their structures were determined.

Conclusions. The results will help to better understand the mechanism of the Leuckart reaction.

The project is supported by NIH grant P20 RR016741 from the NCRR

Addressing the hazards of post-flood mold to public health

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Background. The devastation of the Souris River Flood of 2011 doesn't stop after the water recedes; dangerous molds grow and spread in structures that have been inundated with flood water. Recovery from the flood requires the recognition and proper treatment of mold infestation in damaged structures throughout the Souris River Basin. The goal of this project is to involve students and community members in research and service in order to elevate the awareness of the risk posed by mold in a post-flood environment. Mindful of the disaster in their community, students will be involved in lab research to evaluate novel fungicides that eventually could mitigate the hazard presented by mold infestation.

Methods/Components.

1. Collection and preservation of a variety of molds from structures inundated by flood-water.
2. Synthesis of a limited number of novel formamide fungicides. Novel formamide fungicides have an unknown and potentially new mode of anti-fungal action. They may become instrumental in overcoming resistance to the currently used fungicides.
3. Confirmation (verification) of the structures via spectroscopic methods (IR, NMR, MS) and elemental analysis.
4. Biological (antifungal) testing of the newly synthesized compounds in vitro against molds from structures inundated by flood-water.

Results. The results of the research will provide data for mapping structure-activity relationships among novel formamide fungicides. The results may also have some practical value if novel fungicides will be capable of providing a lasting and efficient control of dangerous molds.

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Effects of R143E Mutation in Superoxide Dismutase 1

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The enzyme superoxide dismutase 1 (SOD1) is an enzyme that eliminates the toxin superoxide in many biological systems. A specific mutation to this enzyme can occur that replaces the positively charged arginine in position 143 with a negatively charged glutamic acid. This mutation may prevent the insertion of copper into the enzyme resulting in an immature enzyme. The immature form of the enzyme, which is associated with Lou Gehrig's disease, can be seen through the absence of an intramolecular disulfide bond needed to stabilize the protein. The goal of the project is to determine the effects of the mutation R143E on the intramolecular disulfide bond present in the fully mature enzyme. The results will be expected to show that there is an intramolecular disulfide bond present in the mature, wild type form of SOD1, but the disulfide bond is not present in the R143E mutant enzyme. Thus far, *E. coli* have been transformed to contain both the wild type and mutant proteins. Under oxidative stress, the wild type SOD1 protein has shown to be present and functional in the transformants; however the functional capability of the mutant form has been inconclusive.

A Descriptive Study of Athletic Training Education Programs Based on Findings on CAATE Standard H and Program Evaluations

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Purpose. The purpose of this study was to determine the effectiveness of the process the CAATE member institutions use to assess outcome-based standards in Standard H.

Methods. This research used a cross-sectional study design. An online survey instrument was used to collect information about the key factors involved in the assessment of the CAATE-accredited programs.

Results. Descriptive statistics were used to assess program director demographics and program demographics. Frequency responses were used to determine performance on the CAATE Standard H during the most recent accreditation visit and to determine the tools used to assess the outcome-based standards in Standard H. BOC exam pass rates were the most frequently used tool to evaluate achievement outcomes relative to educational mission and goals ($N = 84$, $n = 76$, $f = 90.5\%$). The most frequently used tool to evaluate achievement outcomes relative to the quality of didactic instruction was academic course performance ($N = 83$, $n = 65$, $f = 78.3\%$). Clinical-instructor evaluations were the most frequently used tool to evaluate achievement outcomes relative to clinical instruction ($N = 84$, $n = 84$, $f = 100.0\%$). The results indicated that program directors use similar assessment tools to evaluate outcomes for Standard H. Twenty program directors indicated that they had issues with the CAATE Standard H during their last accreditation visit ($f = 23.8\%$).

Conclusions. The fact that program directors are still reporting problems with meeting the CAATE Standard H indicates that there is still confusion about what is necessary to meet this standard.

Revision of the South American Coccinellid Genera *Serratitibia*, *Dilatitibialis*, and *Brachiacantha*.

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South America Ladybird Beetles (family Coccinellidae) are currently the focus of an ongoing effort to taxonomically revise the known fauna of that continent. Because of the large number of taxa involved, this study has been split into several publications, with each publication containing one or several genera depending on species diversity.

The Subfamily Hyperaspidae, including the genera *Serratitibia*, *Dilatitibialis*, *Brachiacantha*, and others, is comprised of small, colorful, and highly patterned lady beetles. These beetles attracted the attention of many early researchers which led to considerable taxonomic confusion. The goal of this research is to examine all known type specimens of described species, reassign genera and species, and describe new species where necessary. Specimens were requested from several international museums and re-identified based on external and genitalic morphologies, habitus images were taken of all new and existing type specimens, and revised species descriptions were written.

The three genera listed above represent revisions of over 200 species. Because of the large number of new species names necessary, traditional methods of selecting names were not used. Instead, names were formed as nouns in apposition using female given names, except where otherwise noted.

Trees and Minot's Historical Flood

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Purpose. Minot's historical flood brought among all damage, the unique opportunity to study some rare biological phenomena. We tried to research the consequences of flood to the trees cultivated in Minot.

Brief methods. Plants were sampled in residence area (University Avenue) and two city parks (north-east Oak Park and southwest Roosevelt Park). In all, 282 trees were sampled. We determined species of all sampled trees. For every tree, the height and flood damage score were estimated. In addition, we estimated the maximal level of flood on the tree location. We also made a virtual transect along the 8th Street (which come almost as a perpendicular from river to the undamaged part of city) and use apple trees (*Pyrus* spp.) as an indicator of damage.

Summary of results and conclusions. There is a statistically significant relation between tree height and the level of damage: bigger trees are less susceptible to the flood. Even stronger is a dependence of a damage on the distance from river along the 8th Street transect.

Rosaceae (rose family) trees (like *Pyrus*, apple and *Prunus*, cherry) and junipers are most damaged. Since result is statistically supported, we may now provide a recommendation not to use these trees for vegetation restoration in flooded areas. Instead, we recommend to use maples (*Acer* spp.), ashes (*Fraxinus* spp.) and other trees which are suffered less.

The support for this study was provided by a Small Research Grant from Minot State University.

Exploring Eye Tracking Differences in Struggling Readers Who Exhibit Difficulties with Visual Closure and Bilateral Coordination, and Controls without Those Characteristics

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This study continued work from two prior MSU Small Grant awards (Borden-King & Asmundson, 2007; Borden-King 2008), and added (Jensen & Borden-King, 2011, 2012) investigation of gaze patterns, saccades and fixations, using a Tobii X120 eye tracker. The earlier studies resulted in the identification of a sub-group of struggling readers who can be discriminated based on unusual visual closure and bilateral coordination sub-scores on the DTVP-2 (Pro-ed, 1993) , BOT-2 (Pearson, 2006), ARI (Woods & Moe, nd.) and QRI (Leslie & Schudt-Caldwell, 2011). Prior findings identified a need to discern whether or not eye movement differences are a contributing factor to these students' reading difficulties, or if the issues lie in processing, or specific problems with performance when no checking mechanisms are available to judge correctness of response. The current study's design was a blind comparative method using an experimental group exhibiting the prototypical sub-type characteristics, matched to controls. Researchers conducting the DTVP-2 and BOT-2 were not involved in the eye-tracking tests; and researchers conducting the eye-tracking studies did not have prior knowledge of the sub-groups into which the subjects were discriminated using the DTVP-2 and BOT-2 subtest scores. Feedback/no feedback conditions were built into the eye tracking research design, as were areas of interest for discerning gaze strategies of subjects. Eye tracking data from the two groups was examined through qualitative coding to refine future hypotheses. Current findings indicate interesting qualitative and quantitative differences in saccade and gaze patterns, which will be illustrated in our poster visuals.

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This project was supported by an MSU Small Research Grant.

Study of a Potential Allosteric Disulfide Bond in CcO

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The subject of investigation in my proposal is a potential allosteric disulfide bond in cytochrome c oxidase (CcO). Knowing whether the disulfide bond is allosteric or not is important for several reasons. One reason being a better overall understanding of allosteric disulfide bonds could be useful in better understanding the infectious proteins that contain them. It could possibly lead to control over the infectious proteins. Also, many known allosteric disulfide bonds contain metals, and metal insertion is not fully understood. If it is found that there is a link between metal insertion and allosteric disulfide bonds this could help provide information on that. I would expect to see that the disulfide bond in CcO is indeed an allosteric disulfide bond and that it is having an effect on the protein, an effect that as of now is unknown. In order to determine whether or not the disulfide bond is allosteric I will mutagenically break the disulfide bond and then transfer the protein through experimental procedures to the *Rhodobacter Sphaeroides* bacteria. The protein will then be extracted and purified before it is analyzed. Tests in the lab will show what changes have been made in the mutant protein and whether or not function is different. If it is different, then research will continue to determine exactly what effect the disulfide bond, which would then be classified as allosteric, would be having.

Selling the Deviants to the Mainstream: The Transformation of Snowboarding Media

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The process of mainstreaming is one that occurs and reoccurs whenever a sports activity comes into favor with the public at large. The process has different ramifications for those activities that, prior to public interest, were seen as deviant or non-traditional. In those cases, the sport specific media plays a vital component to bringing the sport to the masses and thus increasing the likelihood that mainstreaming will occur. The current research looks at the transformation of the sport specific media for a relatively new mainstream sport – snowboarding. The author analyses the top two snowboarding magazines, Transworld Snowboarding and Snowboarder, over a period of 8 years to see how the media associated with this historically non-traditional, and in some cases deviant sport has been affected by the mainstreaming process. Some of the questions explored focus on whether there has been a “taming” of the imagery for a more mainstream consumer, whether the gender representations have remained consistent, and what the impact of mainstream advertising has had on the content of the magazines. The author proposes that while there is evidence of a “taming” of some of the imagery for mainstream consumption in the more recent magazines, the fact that the “deviant” image is in large part what is being sold there has remain general consistency in the magazines’ imagery and content through the years.

Support provided through MSU Faculty Small Research Grants

Promoting Student Ownership in a Non-Traditional Physical Education Teacher Education Internship Course

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Background: Recently in education the idea of promoting student ownership has emerged as a means of authentically engaging students in their own learning. Providing them with ownership over their experiences can lead to students making a greater connection with what they are learning. In Teacher Education, student ownership takes the form of education belonging to the students rather than a “service” that professors are providing to them (Scott, 2009).

Purpose: In this inquiry the experiences of pre-service teachers were explored when they were given the opportunity to have increased ownership of course content and organization through the use of a social constructivist teaching approach.

Context of the Study: The inquiry took place within the context of a non-traditional, elective internship course in a Physical Education Teacher Education (PETE) program. D

Data Collection and Analysis: Data were collected using several different methods including interview, participant observation, and document analysis. Data were analyzed inductively using interpretive methods. Assertions were made based on interpretation of the data associated with the most prominent theme.

Findings: The idea of ownership emerged as a prominent theme across data sources and most often emerged when students discussed the nature of the course, and their relationships with their peers. Interpretation of the various data sources yielded the following assertions: (1) Increased ownership was fostered through the nature of the course and the way it was taught, and (2) The development of a team or group atmosphere encouraged feelings of ownership among the interns.

Travel to present this paper was supported by the Office of Research/Sponsored Programs.

Existence, Uniqueness, Continuity, and Finite Element Approximation of the Weak Solution of an Elliptic Type Boundary Value Problem

Carson Moen and Narayan Thapa Ph.D.

Department of Mathematics and Computer Science

Elliptic partial differential equations play a central role in time-independent equations and in the steady state solutions to parabolic and hyperbolic PDEs. We investigate the existence, uniqueness, continuity of the weak solution of an elliptic type boundary value problem. Numerical results will be presented by finite element method.

Illegal Communications: A Diamond and Gold Smuggling Network in Colonial Brazil

Ernst Pijning, Ph.D.

Department of Social Science—History, Minot State University

This was part of a small research grant during the Summer of 2011, I presented a conference paper about this, which will be available for anyone who is interested.

Brazil became a more valuable colony of Portugal once gold and diamonds had been found in its interior. During the eighteenth century, annual fleets arrived in Lisbon, filled with diamonds and gold. However, because the trade was very restrictive, and as taxes on these products were high, smuggling became rife. Inspections at the port of Lisbon led to the discovery of several major smuggling rings, especially around the 1760s.

In 1763, the Portuguese port authorities in Lisbon found vast amounts of illegal gold and diamonds on the fleet vessel the Xancarona. This led to the arrest of a dozen Brazilian suspects, who were subsequently interrogated and whose goods and papers were confiscated by the Brazilian authorities. The confessions of the contrabandists uncovered a smuggling ring leading from the Mining districts of Brazil's interior to the buyers of diamonds in Britain. The Brazilian suspects were subsequently arrested and sent from Rio de Janeiro to Lisbon. Even though the guilt of the smugglers was obvious, and even though they had confessed to their crimes, at least one of the main perpetrators (Francisco Xavier Telles) was pardoned for his offenses.

This research was supported by an MSU Small Research Grant.

Voice Disorders in North Dakota Teachers

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Purpose. The project was designed to study current literature on voice disorder prevalence in teachers (K-12) around the nation, to develop a survey to determine voice disorder prevalence in North Dakota (ND) teachers, and to determine the need for a community-based voice disorder clinic for ND teachers.

Brief Methods. A literature review was developed to determine existing prevalence data for voice disorders in teachers across the nation. Phase two of the project includes developing a survey tool to gather and analyze data on voice disorder prevalence and vocal hygiene practices in ND teachers and determining if a specialized voice clinic for teachers is warranted within the MSU Communication Disorders Clinic. The final phase will include development of the clinic and website portal for vocal hygiene.

Summary of Results and Conclusion. Results of our literature review revealed teachers form the greatest population of professional voice users in the country with teachers' prevalence of voice disorders being significantly higher than the general population (4.4% - 90% compared to 1% - 36.1%). The prevalence of voice disorders in teachers was related to vocal strain, vocal fatigue, unfavorable air quality, classroom acoustics, and psychosocial and emotional stresses. The effects of voice disorders on the teaching profession were estimated to cost society \$2.5 billion annually. Current research has found the percentage of teachers receiving services is minimal compared to the amplitude of the problem. Consequently, the implementation of a community-based prevention and treatment program for voice disorders in teachers was highly warranted.

Researching the Archives at Tor House

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Grant proposal was for travel expenses to Carmel, CA, to work in the archives at Tor House, home of the poet Robinson Jeffers, subject of my sabbatical project, a book of scholarly essays on the poet and his work. Along with the work of editing the essays of others, my contribution to the book will include an introduction and an essay. Travel was completed March 10-15, 2012. I spent two-and-a-half days at Tor House, some 20 hours, studying the archives (letters, household accounts, photographs, monographs, etc.) as well as the home, tower, and gardens/property) with assistance from three Tor House docents.

I am currently working on two (2) essays on Jeffers, one an ecofeminist reading of Roan Stallion, and the other an argument, following feminist theory, on Jeffers and domesticity. I can report that it was truly helpful to be able to learn about household operations at Tor House during Jeffers' lifetime, and to tour and study the house, Hawk Tower, and the property—neither of which I had ever been able to manage in nearly twenty years of Jeffers scholarship. When Jeffers and his wife, Una, discovered the property upon which they were to build their home and their life, they remarked that they had come to “their inevitable place.” Having been there, and having had the opportunity to study with the deeply knowledgeable docents (scholars themselves, really), I am now able to fully understand what they meant by those words, and this understanding will no doubt infuse my own scholarship.

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Optimal Parameters for Klein-Gordon Equation with Neumann Boundary Condition

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In this paper we study an identification problem for physical parameters associated with damped Klein-Gordon equation with Neumann boundary conditions. The existence, uniqueness, and continuous dependence of weak solution of Klein-Gordon equations are established. The method of transposition is used to prove the Gâteaux differentiability of the solution map. The Gâteaux differential of the solution map is characterized. The optimal parameters are established.

Optimal Parameters for Black-Scholes Option Pricing Model

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Finance is one of the most rapidly changing and fastest growing areas in the corporate business world. Because of this rapid change, modern financial instruments have become extremely complex. New mathematical models are essential to implement and price these new financial instruments. It is a fact that the world of corporate finance, once managed by business students, is now controlled by mathematicians and computer scientists. In this particular interdisciplinary approach, we focus on a ground-breaking result in finance via mathematics, so called the Black-Scholes model for option pricing. In this work, we show existence, uniqueness, and continuity of a weak solution with respect to parameters. In addition, optimal parameters will be estimated via inverse problem techniques.