



Dear Student Researchers and Colleagues:

Welcome to the fourth annual Conference on Undergraduate and Graduate Student Research! A joint effort established by the Graduate School, the Office of Research Services and Sponsored Programs, the Office of Technology Transfer and the Office of the Vice President for Research, this conference is a testament to the importance of talented, creative and dedicated student researchers to both The University of Akron and the surrounding community.

Akron's rich history of invention began with inquisitive individuals, who were driven to find innovative solutions to practical problems. Today's event highlights Akron's continuity in research excellence by recognizing successful collaborations between UA students, faculty and staff, as well as researchers from industry and other academic institutions.

Under the direction of Billi F. Copeland, Director of the McNair Scholars Program, a committed group of faculty and staff worked to make this conference a reality. Their efforts recognize the importance of collaborative research in cultivating the potential of the next generation of scholars, researchers, and community leaders.

I'd like to once again congratulate the participants – students, faculty and staff – whose outstanding work throughout the year is certainly worthy of respect. I encourage UA's researchers to continue searching for creative solutions to the increasingly complex challenges facing our community and our world.

With best regards, I remain

Sincerely,

A handwritten signature in dark ink, reading "George R. Newkome". The signature is fluid and cursive, with a long horizontal stroke at the end.

George R. Newkome, Ph.D.
Vice President for Research and Dean, Graduate School
Oelschlager Professor of Science and Technology



Office of the Senior Vice President and Provost
Akron, OH 44325-4703
(330) 972-7593 Office
(330) 972-8699 Fax



Dear Student Researchers and Faculty Mentors:

I am pleased to have this opportunity to congratulate you on your research endeavors here at The University of Akron. Whether you are an undergraduate or graduate student or a faculty member in one of our departments or schools, you should be proud of the work that you have been doing to promote student success and to generate new knowledge and understanding through research. The process of student research, facilitated and mentored by dedicated faculty, is a powerful learning and teaching pedagogy with long term benefits to all concerned – the student, the faculty, the institution, the community, and society as a whole. We here at The University of Akron are fortunate to have you in our midst.

In Fall 2006, The University of Akron began a three-year project with nine other institutions under the leadership theme of Undergraduate Research in association with the Carnegie Academy for the Scholarship of Teaching and Learning. A few of the 2008 goals of this effort, led by a team working through the Institute for Teaching and Learning in Leigh Hall, are to: (1) Provide financial support for faculty to attend national meetings at which their undergraduate students are presenting research results; (2) Host nationally recognized leaders in the area of undergraduate research pedagogy who will provide seminars and workshops for our faculty and students; and (3) Facilitate effective communication among units on campus and between the faculty and students concerning undergraduate research opportunities. We hope that this initiative will encourage more faculty and students to become involved in undergraduate as well as graduate research, and help to foster a culture of scholarship and innovation.

I thank all of you who participated in making today's conference a success, and especially congratulate the award winners announced here today. This recognition is noteworthy and reflects on the exceptional contributions being made by the student researchers and faculty mentors at The University of Akron. I wish you many more successes in research and look forward to future showcases of the research accomplishments of our campus community.

Sincerely,

Beth Stroble, Ph.D.
Senior Vice President and Provost

The Conference on Undergraduate and Graduate Student Research gratefully acknowledges our sponsors for their generous support of the students

THANK YOU
to our
SPONSORS

The Office of the Vice President of
Research and the Dean of the
Graduate School

The Office of Senior Vice President,
Provost and Chief Operating Officer

The Institute for Teaching and
Learning

University College

The Graduate School

The Office of Research Service and
Sponsored Programs

The Office of Technology Transfer

The University of Akron Research
Foundation

The College of Nursing

Buchtel College of Arts and Sciences

College of Education

College of Fine and Applied Arts

The College of Polymer Science and
Polymer Engineering

School of Law

College of Business Administration

College of Engineering



*CONFERENCE ON UNDERGRADUATE AND
GRADUATE STUDENT RESEARCH TABLE OF
CONTENTS*

Table of Contents

Welcome Letters

CUGSR Sponsors

Table of Contents

*2008 Conference Committee &
Volunteers*

Conference Agenda

Keynote Speaker Bio

*Concurrent Oral Sessions
Presentation Schedule*

*Poster Sessions Presentation
Schedule*

*Criteria for Outstanding
Student Research Award &
Past Winners*

Mentor of the Year Award

Presentation Index

CONFERENCE ON UNDERGRADUATE AND GRADUATE STUDENT RESEARCH CONFERENCE COMMITTEE AND VOLUNTEERS

CUGSR Committee

- Billi Copeland, Director, McNair, Chair of the Conference Committee
- Annabelle Foos, Assoc Dean, Arts & Science
- Bonnie Williams, Asst Dean, University College
- Susan Hanlon, Assoc. Prof, Management, Fitz Fellow
 - Dale Mugler, Dean, Honors College
- Mark Tausig, Assoc. Dean, Graduate School and Professor, Sociology
 - Kathleen Tusaie, Asst Prof, Nursing
 - Francis S. Broadway, Assc Prof, Education
 - Alyison Leigh, President, Graduate Student Government
 - Gregory Plagens, Asst Prof, PAUS
- Marj Riccardi, Admin. Asst., The Maurice Morton Institute of Polymer Science

Volunteers

Additionally, we would like to thank our volunteers who have dedicated time and service to this conference. There are many faculty, staff, administrators and students who have generously donated their time and efforts.

To our faculty who have agreed to judge and moderate the sessions-thank you for your great contribution to the conference.

The University of Akron
Conference on Undergraduate and Graduate Student Research
Student Union - Ballroom Level

Director of Ceremonies

Alyison Leigh
President, Graduate Student Government

Kimberly Saviers
Associated Student Government

Conference Agenda

[Thursday, March 27, 2008](#)

7:45 - 12:00 p.m.	Check-In for Participants	Student Union 2 nd Flr.
8:30 - 8:40 a.m.	Welcome Remarks and Raffle <i>Dr. Mark Tausig</i> <i>Associate Dean, Graduate School & Professor of Sociology</i>	Student Union Theater
8:40-8:55 a.m.	Presentation Set-Up	
10:00 - 2:30 p.m.	Graduate School Fair	Ballrooms BCDE
9:00 - 10:45 a.m.	Concurrent Oral Sessions I	See presentation schedule
9:30 - 12:00 p.m.	Poster Session I	SU Ballroom Foyer
10:30 - 11:45 a.m.	Concurrent Oral Sessions II	See presentation schedule
12:00 - 1:30 p.m.	Awards Recognition Luncheon	Ballroom A

Welcome by Dr. George R. Newkome

Vice President for Research and Dean of the Graduate School; Professor of Polymer Science and Chemistry, Intellectual Property Fellow, James and Vanita Oelschlager Professor of Science & Technology

Introduction of Dr. Elizabeth Stroble by Kimberly Saviers

Associate Student Government

Welcome Remarks by Dr. Elizabeth Stroble

Senior Vice President, Provost and Chief Operating Officer

Introduction of Our Guest Speakers by Alyison Leigh

President Graduate Student Government

Dr. Charles J. Fey, *Associate VP and Dean Student Life*
and

Dr. N. Margaret Wineman, *Dean College of Nursing*

Presentation of Outstanding Student Research Awards

Alyison Leigh

President Graduate Student Government

Mentor Recognition

Dr. Mark Tausig

Associate Dean, Graduate School and Professor, Sociology

1:15 - 3:15 p.m.	Poster Session II	SU Ballroom Foyer
1:20 - 2:40 p.m.	Concurrent Oral Session III	See Index
3:15-3:25	Judges Submit Final Forms	
3:30 - 4:00 p.m.	Closing Ceremony & Student Presentation Awards and Raffle Billi F. Copeland <i>Director, McNair Scholars Program</i>	SU Ballroom A

Biography of Keynote Speaker

Biography of Dr. Charles Fey

Following a national search, Dr. Charles J. Fey — the vice president for student affairs at University of Maryland, Baltimore County — has been appointed vice president for student affairs at The University of Akron. He will begin his duties at UA on Sept. 28.

As Akron's chief student affairs officer, he will lead a division relentlessly focused on student success. He will provide leadership in all student affairs areas, ensuring that those units are involved in and contribute significantly to the success of university-wide programs and services that provide a comprehensive and dynamic student experience at The University of Akron.

UMBC is an honors university in Baltimore with 12,000 students; last year, the GPA for entering students was 3.65.

Fey has been at UMBC for a decade. He oversees residence life, student judicial affairs, student life, multicultural affairs, social justice and diversity, and health, counseling, career, commuter and transportation services.

Prior to UMBC, He was dean of students at the University of Texas at El Paso for five years. He also served as vice president and dean of student life at Our Lady of the Lake University in San Antonio.

Fey earned a doctor of education degree in higher education administration from Texas A&M University, a master of education degree in counseling education and college student personnel services from Pennsylvania State University, and a bachelor of arts degree in liberal arts, also from Penn State.

"Dr. Fey brings to Akron a strong record of accomplishment and a deep understanding of emerging issues and trends that impact metropolitan campuses," said Elizabeth Stroble, senior vice president and provost and chief operating officer. "He will be a strong advocate for all of our students and an innovative leader in our efforts to further strengthen retention and recruitment."

*Biography of N. Margaret Wineman, PhD,
RN, CNS*

Dean and Professor

N. Margaret Wineman, PhD, RN, CNS, has over 30 years experience as an educator, researcher, and clinician. She currently serves as Dean and Professor at The University of Akron College of Nursing. Dr. Wineman completed her initial nursing education at Saint Vincent's Hospital School of Nursing in 1971 and her baccalaureate degree in psychology at Marymount Manhattan College in 1975. She graduated from Yale University with an MSN in psychiatric/mental health nursing in 1977 and from the University of Rochester with a PhD in nursing in 1988. Dr. Wineman received a second master's degree in Community Counseling and a Certificate in Addictions Counseling from The University of Akron in 1999. Her career has encompassed many roles, including teaching baccalaureate, masters, and doctoral students, coordinating a PhD in Nursing Program – a collaborative program with Kent State University College of Nursing (1999-2002), serving as Senior Director of the College of Nursing (2003-2004) and Director, and later Assistant Dean of Nursing Research and Scholarly Activity (2000-2006).

Dr. Wineman has a strong commitment to scholarship and the advancement of health care through research. Most recently, her scholarly interests have focused on building an organizational culture conducive to research and scholarship. During her tenure as Assistant Dean, she was successful in establishing an infrastructure for research in the College of Nursing, building interdisciplinary and inter-organizational collaborations, assisting faculty in the development and implementation of funded programs of research, and helping faculty secure over \$3 million in funding from the National Institutes for Health. Dr. Wineman's own research and scholarly presentations and publications have focused on the mental health issues related to chronic disability and intimate partner violence. This research has been published in numerous professional journals and presented at scholarly conferences.

Dr. Wineman's leadership has been acknowledged through awards for leadership, mentoring, and research, including the YWCA Women of Professional Excellence, American Psychiatric Nurses Association Ohio Chapter Leadership, Yale University Distinguished Alumna, and Sigma Theta Tau Gamma Delta Chapter awards for nurse mentoring, excellence in education, and excellence in research. In addition to being a 2005 American Association of Colleges of Nursing/Helene Fuld Academic Leadership Fellow, Dr. Wineman was selected to participate in the Inaugural Academic Leadership Forum at The University of Akron (2005-2006).

CUGSR Outstanding Student Research Nomination Process

The Outstanding Student Research Award is given to an individual whose research endeavor is judged to be an outstanding contribution to his or her field of study. A strong letter of support from the research advisor is necessary for consideration. Other criteria includes that the research: poses an important question, demonstrates strong theoretical rationale, utilizes systematic methods, publishable in a top journal, has a well-written summary, and contributes to developmental science and theory.

The award recipient must have completed his or her research as a part of a University of

Akron program of study, and the presentation of the work must have taken place during the current or prior calendar year of the award. The award is presented at the annual Conference on Undergraduate and Graduate Student Research.

The Conference on Undergraduate and Graduate Student Research would like to thank the **Institute for Teaching and Learning and the Office of the Chief Operating Officer and Provost** for funding the undergraduate awards. The **Office of the Vice President of Research and the Dean of the Graduate** is also a major contributor to this conference.

Outstanding Student Research Award Recipients

2004-2005

Undergraduate:

Sylvia Shabaya, nominated by Dr. Chris Ziegler, Department of Biology

Graduate:

Pavel Paramonov nominated by Dr. Segei Lyuksyutov, Department of Physics

2005-2006

Undergraduates:

Neil Treat nominated by Dr. William Brittain, College of Polymer Science

Monika Dutka, nominated by Dr. David Ritchey, School of Communication

Graduates:

Nenad Stojilovic nominated by Dr. Robert Mallik, Department of Physics

Carol A. Savery, School of Communication

2006-2007

Undergraduates:

Elena Hissett nominated by Dr. Brian Bagatto, Department of Biology

John J. Reho nominated by Dr. Rolando J.J. Ramirez, Department of Biology

Graduates:

Lucas Dos Santos nominated by Dr. Judit E. Puskas, College of Polymer Science

Ashish Jagtiani nominated by Dr. Jiang Zhe, Department of Mechanical Engineering

The 2008 Committee for the Outstanding Student Researcher Award

Dale Mugler, UA Honors College, Chair of CUGSR Outstanding Student Research Award

Raouth Kostandy, College of Nursing

Kevin L Kreider, Department of Theoretical and Applied Mathematics

Michael A Nelson, Department of Economics

David Perry, Department of Chemistry

Rex Ramsier, Assistant Provost and Department of Physics

*CONFERENCE ON UNDERGRADUATE AND
GRADUATE STUDENT RESEARCH*

Faculty Mentor of the Year Award

Recognizing that good mentors are the key to helping undergraduate and graduate students become excellent researchers, the CUGSR Committee began soliciting nominations for the "Faculty Mentor of the Year Award" in 2005. Graduate or undergraduate students may nominate their advisor as a candidate for CUGSR Mentor of the Year Award. To nominate a mentor, students must submit an essay that includes information about: mentor's length of service with student researcher, evidence of commitment to the academic development of the student and research by the mentor, regularity of meetings between student and mentor, demonstrated ability to inspire, motivate, and advocate for student, and mentor's level of involvement to facilitate scholarly research.

Four recipients are chosen by a committee of graduate and/or undergraduate students and receive a plaque and certificate.

*CUGSR Mentor of the Year Award
Recipients*

2005-2006 Mentor of the Year

Dr. George G Chase
Dr. Sadhan C Jana
Dr. Rex D Ramsier
Dr. Maria A Zanetta

2006-2007 Mentor of the Year

Dr. Francis S. Broadway
Dr. David Ritchey
Dr. Todd A. Blackledge
Dr. Marguerite DiMarco

*CONFERENCE ON UNDERGRADUATE AND
GRADUATE STUDENT RESEARCH*

Abstracts

Visual Arts

Mark Soppeland, Distinguished Professor of Art at the Myers School of Art will present a series of successful partnerships between students and faculty mentors in the creation of permanent and temporary public art projects. Professor Penny Rakoff will moderate.

The Creation of Public Art Projects

Presenter: *Chel-c Blackerby, Jeff "JD" Dumire, Mike Wohlwend, Eden Benton, Robert Hoppin, and Mark Soppeland*

Institution: University of Akron

Faculty Mentor: Mark Soppeland

Students were involved in conceptual design, material research, and real-life production of small and large scale art works, often accompanied by events attended by large audiences from the community. Students will discuss their experiences with these projects and the subsequent development of public art projects on their own.

Design X Nine

Presenter: *Dominic Caruso, Julia Hartman, Seth Trowbridge, Scott Rutan, Janice Troutman, and John Morrison*

Institution: University of Akron

Faculty Mentor: Janice Troutman and John Morrison

Design For 24

Presenter: *Todd Bertsch*

Institution: University of Akron

Faculty Mentor: Janice Troutman and John Morrison

Electroplastiques

Presenter: *Kirk Mueller and Nate Mueller*

Institution: University of Akron

Faculty Mentor: Janice Troutman and John Morrison

EMU Tiles

Presenter: *Emily (Wilson) Ulm*

Institution: University of Akron

Faculty Mentor: Donna Webb

Emily is the owner of EMU Tiles and provides tiles for architectural installations and has done work on the tile project at Robinson Academy.

Japanese Style Wood Fired Climbing Kiln

Presenter: *Carol Ohl*

Institution: University of Akron

Faculty Mentor: Donna Webb

Carol has built a Japanese style wood fired climbing kiln that includes a rotating group of students and artists who put work into the kiln and help with the firing. Carol has worked on the tile project at Robinson Academy and the fountain at the Student Union.

Researcher: Hamza Abubakari and Tom Vo
Institution: University of Akron
Faculty Mentor: Dr. Julie Zhao

Application of Kalman Filtering in Weather-Balloon Telemetry

Weather-balloon telemetry constitutes a major component of the Intelligent Balloon Project at the University of Akron. This project is supported by the Ohio Space Grant Consortium (OSGC) with the objective of developing portable and inexpensive platforms for environmental monitoring and surveillance of near-space in the future. A significant challenge of weather-balloon telemetry, however, has to do with "cleaning up" of the noisy sensor data which is attributable to inherent sensor noise and atmospheric turbulence. Due to its robustness and quick response, the Kalman filter was used to filter the altitude and temperature data in real-time in our premier launch. We present our Kalman filter algorithm and results that show remarkable improvement in the quality of the data.

Researcher: Melissa Adams and Stephanie Kirkpatrick
Institution: University of Akron
Faculty Mentor: Dr. David Ritchey

For my eyes only? The MySpace.com crisis in Ohio schools

Schools across the county have recently been scrambling to protect their students from online predators; however no one ever thought that they would have to protect the students from themselves. This phenomenon of the MySpace crisis does not exclude Ohio schools by any means. In fact, in recent months many Ohio papers have been covering how inappropriate and offensive many students MySpace pages are. Students are being expelled and suspended from school in some cases for what they have posted on their sites. It would seem then that the schools are handling the problem, but as we discovered that is not the whole story. This paper examines the current crisis that many local schools are facing with MySpace, looking first at the issue and how it came to be, then examining what is currently being done to stop this potential crisis.

Researcher: Melissa Adams
Institution: University of Akron
Faculty Mentor: Carylon Anderson

Traits and Communication Skills among Leaders

This study takes a trait perspective using the traits approach to examine different traits and communication skills that leaders say they have and use within their organizations while interacting with subordinates. More specifically, it will examine if the leadership traits differ depending on the gender of the leader as well as the type of organization they work for.

Researcher: Angela Adkins
Institution: University of Akron
Faculty Mentor: Dr. Rebecca Erickson

Narrowing the Gap Between Online and Offline: An Analysis of Online Social Networking Sites and Bridging Social Capital

Online social networking sites such as Myspace seem particularly well-suited to forming the loose connections between diverse social networks, or weak ties, associated with bridging social capital. This study investigates the relationship between online social networking and bridging social capital using survey data from 154 university students. A version of the Internet Social Capital

Scales (Williams 2006) was used to measure online and offline bridging capital across four dimensions: outward-looking perspective, contact with a broad range of people, viewing oneself as part of a broader group, and diffuse reciprocity with a broader community. Results show social networking site users have more total bridging capital than non-users, and a positive association exists between the degree of online social networking and bridging capital. However, users have higher levels of offline bridging capital, indicating that face-to-face interaction involves a more diverse range of people while online exchange tends to involve like-minded individuals. Together, this evidence suggests that social networking sites are a useful tool for enlarging and maintaining a diverse social network, but the ways in which people blend their offline and online relationships are complex. It is suggested that future research focus on providing longitudinal data and in-depth site studies.

Researcher: Vandana Adya and George Giakos

Institution: University of Akron

Faculty Mentor: Dr. George Giakos

Detection of Signal Parameters and Analysis of Backscattering Polarimetric Imaging Signatures using Molecular Optical Contrast Agents and Preclinical Liquid Phantoms

Early detection of cancer is a major concern these days. To enhance this process, proper Imaging techniques must be incorporated. Optical Imaging using polarimetric techniques is a very reliable, efficient, and non-invasive method. To do so, off-the-shelf pre-clinical solutions have been used, whose refractive indices are similar to that of tumor, or other disease conditions. The major role, however is the detector's and we chose the single pixel detector, NIRVANA. The reason to choose NIRVANA is its high signal to noise ratio and sensitivity. It provides information at the pixel level and is user friendly. It operates in four modes namely, signal, difference, autobalance and 10X autobalance. The mode of our interest was Autobalance, since it provides us with the information on backscattered signal, with the DC noise eliminated. It reduces the common mode noise by 50 dB at frequencies from DC to 125 KHz. Thus, this study not only provides accurate measuring technique, but also assesment and testing.

Researcher: Ashley Ahlborn

Institution: University of Akron

Faculty Mentor: Dr. David Ritchey

Crisis and The University of Akron's Infocision Stadium

In the fall of 2009, The University of Akron's new InfoCision Stadium will be open for business. This is a public relations crisis because it is causing much controversy in the Akron Community. The first crisis is what to do with Akron's old football stadium, the Rubber Bowl. The Rubber Bowl's age and size leave many questions as to what can be done with it in years to follow. The second is the small private owned businesses that are being dismantled to make room for the new stadium, and dorms that are to be built with it. Many small business owners such a Manuel Nemer are not going to give up without a fight. Nemer has owned his business for over 30 years, and he is not ready to give it up.

The third crisis that comes with the new stadium is safety. The University of Akron has gained a reputation over the years for not being the safest of college campuses. The new stadium will bring many people into the University's neighborhood, and it seems nothing has been done to prepare to keep them and their cars safe. A plan needs to be drawn up to keep Akron students, and game attendees safe.

Needless to say there is much to think about when it comes to the new stadium to be built of campus. The public relations department at The University of Akron has not even begun to plan for the current and future crisis that is InfoCision Stadium.

Researcher: Elif Alyamac

Institution: University of Akron

Faculty Mentor: Dr. Mark Soucek

Estimation of Solubility Parameters for Inorganic Modified Epoxy and Surface Active Acrylics

The miscibility of an acrylic copolymer and an epoxide oligomer was evaluated using Hansen solubility parameters. The acrylic copolymer contained methyl methacrylate (MMA), butyl acrylate (BA), hydroxyethyl methacrylate (HEMA), and 2,2,2, trifluoroethyl methacrylate (TFEMA). The epoxide was diglycidylether of bisphenol A (DGEBA) based epoxide with and without tetraethoxysilane (TEOS) modification. The solubility of the polymers was evaluated in a set of 30 different solvents of which Hansen solubility parameters are known. The evaluation of the solubility was implemented to a computer program as an input. The solubility parameters predicted by optimization method were compared with those calculated by group contribution methods. Three dimensional Hansen solubility parameters of the polymers were predicted by a nonlinear unconstrained optimization technique. The effect of fluorinated monomer on the solubility behavior of the acrylic copolymer was investigated by varying the TFEMA concentration. Likewise, the effect of inorganic modification on the solubility of epoxy has been examined. The radii of Hansen spheres for the polymers were also predicted and the overlap factor of the spheres was calculated. The knowledge of this study will be helpful for designing two phase systems based on epoxy and acrylic resins.

Researcher: Branden Archer and Kranthi Mamidisetty

Institution: University of Akron

Faculty Mentor: Dr. Shiva Sastry

Come! Compose and Simulate Conveyors!

Conveyors systems are important for many applications. We present an exciting tool that allows users to specify conveyor systems graphically.

The tool will generate a discrete-event simulator based on the specification. By executing the simulator, users can investigate the performance of the specified system.

We utilize an approach called Coupled Conveyors that relies on three building blocks: Segment, Turnaround, and Crossover. By developing C++ classes that represent the behavior of these building blocks and allowing instances of these classes to execute under the OMNet++ discrete-event simulation framework, we reduce the problem of developing a simulator for a specified conveyor system topology to one of generating an appropriate input file for this generic simulator. The Java-based tool we present allows users to specify topologies and generates the input file required by the simulator. By focusing on the material-handling conveyor systems, we show how the task of programming composed conveyor systems is simplified. The simulation demonstrates that the conveyor system sorts materials as expected.

The compositional approach to conveyor systems enable simpler design processes, improved fault diagnostics, and hence, reduces operating costs. The tool we present allows users to verify the performance of a specified topology before implementing the system.

Researcher: Maiko Arichi
Institution: University of Akron
Faculty Mentor: Dr. Dale Mugler

MONITORING ISCHEMIC CHANGES IN ELECTROCARDIOGRAMS USING DISCRETE HERMITE FUNCTION

My research is to provide automatic identification of ischemic and other pathological changes in long term ECG signals using mathematical expansions involving the Discrete Hermite functions. The discrete Hermite functions are eigenvectors of one of the shifted Fourier matrices, as discovered by Mugler & Clary [2] [3]. They serve as shape functions, and are an orthonormal set of functions providing computationally efficient expansions for arbitrary signals, such as electrocardiograms (ECG).

The Hermite functions are generated as eigenvectors of a symmetric tridiagonal matrix that commutes with the centered Fourier matrix. The Hermite coefficients may be taken from a simple dot product between an individual ECG complex extracted from the long term ECG and the corresponding discrete Hermite function. Using the first 50 coefficients from products with the functions would allow the algorithm to become closer to real-time.

I am working to identify ischemic features in the ECG complex, namely ST segment and T wave changes, not only by using Neural Networks but also by a direct mathematical computation. Ischemic heart disease is one of the common causes of death and physicians commonly employ an ECG in the investigation of the onset of this disease. This investigation would also include an investigation of the QRS complex using discrete Hermite functions[6], with the goal of identifying premature ventricular ectopic beat, left bundle branch block beat, the right bundle branch block beat, atrial premature beat, the ventricular flutter wave, and the ventricular escape beat.

Researcher: Michael Avon and Brad Shindle
Institution: University of Akron
Faculty Mentor: Dr. Alper Buldum

Energy Considerations of Fluid Flow Through Nanotubes

The study of fluid-flow through nanotubes has only just begun to be explored for its possible purposes in the biological and mechanical arenas of life, whether engineering or medical. This research into the field of fluid flow through nanotubes seeks to outline some of the energy considerations of how fluid travels through a carbon nanotube, particularly from a molecular dynamics standpoint. In an effort to apply the knowledge gained to the continuum model which is significantly more abstract and mathematically intensive.

The molecular dynamics preliminary approach provides a tangible understanding of how the atoms interact together on a microscopic level and supplies both the researchers and the readers with visual pictures, videos, and palatable results. To do this, user-friendly software, Cerius II, is used to model both the nanotube and the fluid. By using a noble gas such as argon and beginning with the simple case of two parallel graphite sheets and then progressing to more complicated carbon nanotube structures, this research adequately depicts the both the potential and kinetic energies in stagnant and dynamic flow. In essence, this research seeks to answer the ever-present question of whether it is even possible to get fluid to flow on a nanoscale by satisfying the energy question first.

Researcher: Avinash Baji and Shing-Chung Wong
Institution: University of Akron
Faculty Mentor: Dr. Shing-Chung Wong

Enhanced Mechanical Properties of Electrospun Poly(ε-caprolactone) Fibers

Biocomposites found in nature show superior mechanical properties compared to their constituent materials when tested alone. By using electrospinning-enabled techniques, we seek to understand the mechanisms of these nano-structured biocomposites. The ultimate goal is to study the mesoscale (1) structure, (2) dynamics and (3) functionality of electrospun nanofibers by mimicking the protein-guided mineralization of extracellular matrix in skeletal tissue. The mechanical properties of the electrospun poly(ε-caprolactone) (PCL) were characterized. The molecular orientation and morphology were investigated using both wide angle and small angle X-ray diffraction techniques. In the project, the degree of crystallinity and crystalline orientation of the loaded and undeformed electrospun polymer fibers were compared, and the relationships between molecular orientation and mechanical property were elucidated. The electrospinning process influences the molecular chain conformation and thus optimizes the mechanical properties of the material. It is evident that polymers under spatial confinement afforded by electrospinning exhibits superior mesoscale mechanical performance in comparison to those derived from non-confined (bulk) systems under tension. This research is presently funded by the National Science Foundation under the research advisor's CAREER award.

Researcher: Mili Banerjee

Institution: University of Akron

Faculty Mentor: Dr. David Ritchey

The University of Akron and Upsurge in Off-campus Crime

This case study deals with The University of Akron and the public relations crisis it faced in the Fall of 2006 as a result of the sudden spike in crimes on the periphery of the campus. The crimes were related to violent armed muggings and break-ins, which victimized University students living in the area. The situation was significant because of the vast population of international and out of state students residing in the affected zones. The sustained negative perception about the campus vicinity soon became a public relations crisis that could have permanently marred the institute's reputation among students, parents, and potentially threaten new admissions. This case study, therefore, highlights the crisis communication measures employed by the University to alleviate this situation and evaluates its effectiveness.

Researcher: Mili Banerjee

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Anderson

Leading with Power and Influence: Rethinking the Leadership Grid

This paper looks at the role of power and influence in relation to Blake and McCanse's 1991 Leadership Grid. Although Blake and Mouton's (1968) original Managerial Grid acknowledged power as one of the three universal features that influence a leader's actions in dealing with relationships or tasks, its prominence has since faded. Thus, this paper examines the role of power in determining leaders' behaviors on these two dimensions and shows how power is critical to influencing both. Further, an argument is made for the inclusion of power as a new dimension on the Leadership Grid.

Researcher: Jennifer Barber, Melissa Adams, Mili Banerjee, James Durbin, and Salma Benhaida

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Anderson

Leaders Speak Out About Leading: Does It Really Make A Difference?

The Critical Incident Technique (Flanagan, 1954) has had little attention paid to its value of examining the telling of stories about decision-making that may influence future behaviors. This study examines critical incidents (both positive and negative) that leaders have experienced and how their handling of the incidences affected their organizations. Additionally, the author asked if the leaders relied on other leaders to assist with the decision-making drama associated with memorable situations within the organization.

Researcher: Salma Benhaida

Institution: University of Akron

Faculty Mentor: Dr. David Rtichey

In the Board we Trust ׃PR Crisis at The University of Akron

In November 2007, a PR crisis emerged at The University of Akron when the board of trustees approved the acquisition of a house owned by the son of one of its members in order to make way for the \$61-million football stadium project. The property sold for \$110,000; thus, an increase in value of 43% within a twelve-month span. This incident affected the integrity and ethical values of the board, subsequently, it received wide coverage from various news sources such as The Akron Beacon Journal and The Plain Dealer; it also resulted in further investigations by The Ohio Controlling Board.

In this paper, I will examine the different aspects and resulting repercussions of the aforementioned PR crisis, I will also evaluate the strategies used by The University of Akron to manage the resulting negative publicity.

Researcher: Salma Benhaida

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Anderson

Leaders Speak Out About Intercultural and Gender Issues

This paper looks to examine leadership from a gender and intercultural perspective. Questions addressed in this study include such issues as׃ Are current women leaders forced to communicate in a masculine style or form? How important to leaders is the development of strong intercultural leadership skills in today's global economy?

Researcher: Sheela Bhandarkar and Dr. Jiang Zhe

Institution: University of Akron

Faculty Mentor: Dr. Jiang Zhe

MULTI-ANALYTE SORTING USING A TWO STAGE MICROFABRICATED DILELECTROPHORETIC ACTUATOR

Bio-particle sorting has been of interest for research in medical diagnostics to aid in chemical and biological analysis. Conventional methods such as Fluorescence-Activated-Cell Sorting (FACS) rely on labeling of particles to detect and sort particles. We present the design and fabrication of a two stage label-free microfluidic electrical sorting based on dielectrophoresis to separate multi-analyte samples. Dielectrophoresis polarizes suspended particles as a result of an applied non-uniform AC electric field. This induces a preferential movement of particles characteristic of their conductivity, permittivity and size. The device uses three pairs of coplanar electrodes to sort upto four types of

particles. We demonstrate the working concept using Juniper (~17 μm to 23 μm) and cottonwood pollen (~20 μm) and polystyrene beads of two different sizes.

Pollen particles are separated from the polystyrene particles in the first stage on account of opposite dielectrophoretic polarities. In the second stage, pollen particles are further separated from each other owing to their different dielectrophoretic properties. This arises from the difference in their material and surface properties of pollen. However, the polystyrene particles are sorted due to difference in their sizes. Experimental conditions such as applied voltage, frequency, microchannel dimensions, and flow velocity were optimized to increase sorting efficiency.

Researcher: Sudha Bhattarai

Institution: University of Akron

Faculty Mentor: Dr. Kathy Liszka

Robustness of Wireless Mote Communication

Wireless sensor networks are useful in a wide range of applications. Motes are used as a media for communication in a wireless network. A robust network is a stable network that can endure various noise factors present in the system. The number of packets dropped during communication is an important parameter to determine the robustness of the system. This can be further explained as properties, which are insensitive to small fluctuations from the actual assumption on which they depend.

To measure packets dropped, we used mica2Dots as transmitters. Mica2 motes are used as receivers. Each mote is battery-powered with an Atmel processor, and can communicate in a wireless fashion by broadcasting messages over a radio frequency of xxx Hz. They are energy constrained and the range of their radio transmission is limited to their neighborhood. The information about the number of packets sent, dropped and corrupted is shown using our interface. Taking this information, we can analyze how robust our system is and what applications are suitable for this system.

Researcher: Justin Brantner

Institution: University of Akron

Faculty Mentor: Dr. Jean Pan

"The Retention and Understanding of High School Biological Science"

Currently, there are certain National Science Content Standards that are to be met by students upon reaching the end of each grade level in the secondary schools. The sciences have gained the reputation of areas where students struggle the most academically. This research study aimed at answering the question of what information students are retaining from their high school biology course(s). It is hypothesized that students recently coming out of high school do not have a solid retention of the principle ideas in biology that should have been addressed according to the National Science Content Standards. An assessment was administered (consisting of 25 questions that were all tied to the National Science Content Standards) to students in the entry level biological science courses during the Fall 2007 and Spring 2008 semesters at the University of Akron. The results from this assessment appear to have trends such that students appear to have better retention on certain topics within the discipline of biology than others, and that the students in the major's biology course appear to have higher retention levels than non-majors (averages for the majors and non-majors courses were 66.41% and 62.19% respectively). Gaining insight into the amount of knowledge students are retaining in the biological sciences upon exiting the secondary

schools can provide useful data into answering the question of what students are truly retaining and taking away from their high school science courses.

Researcher: Nena Brierly
Institution: University of Akron
Faculty Mentor: Dr. Adil Wadia

Water Movement in the Ocean and its Effects on the Atmosphere

Majority of the Earth's water is stored in oceans and seas. The research discusses many factors that cause movement of ocean waters and how they affect the Earth's atmosphere. These factors include tides, water density, surface currents, Coriolis Effect, and hydrologic cycle. The paper will discuss the properties of water, its role in transferring heat, which is an important concept for the hydrologic cycle and global wind patterns. Wind moves the surface waters of the ocean, while temperature and density control the movement of water beneath the surface. Gravitational attraction from the Sun and the Moon also exert an influence on water movement in the oceans. There are various ways waters in the ocean move and the effects that exercise their influence on the Earth's weather and climate which the paper will discuss in detail.

Researcher: Yangjun Cai
Institution: University of Akron
Faculty Mentor: Dr. Bimin Zhang Newby

Dewetting of Polystyrene Thin Films on Poly(ethylene glycol) Modified Surfaces as a Simple Approach for Patterning Protein

A simple technique for patterning proteins utilizing dewetted polystyrene (PS) droplets is demonstrated. The polystyrene thin film was spin coated on a poly (ethylene glycol) (PEG) silane modified surface. As the PS film dewets from the surface, upon annealing, to form droplets, the PEG-silane modified surface is exposed, which retains its capability to resist protein adsorption, while the PS droplets allow selective adsorption of protein. In contrast to the undewetted flat PS film, the droplet surface had a greater amount of protein adsorbed. Atomic force microscopic scans reveal that the roughness of the droplet surface is higher, and a multilayer of protein results on the droplet surface. Moreover, micro- and nanoscale droplet patterns can easily be achieved by tuning the thickness of PS thin films. Since dewetting approaches for generating ordered dewetting droplets have been successfully generated by others, those approaches could be easily combined with this technique to fabricate ordered protein patterns.

Researcher: Maureen Cheung
Institution: University of Akron
Faculty Mentor: Dr. Stephanie Lopina

Development of a Swine Model and the Evaluation of Novel Compounds for the Prevention of Pelvic Adhesions

Introduction: Adhesions following surgery represent a significant problem often resulting in pain, disability, and additional surgeries. There are compounds available for the prevention of post-operative adhesions, but barrier effectiveness is difficult to assess. Currently accepted models of adhesion comparison are limited by qualitative methods with potential bias and little comparison ability.

Objective: The purpose of this study was to develop a standard injury technique and quantitative assessment method to evaluate adhesion prevention by novel compounds.

Development: The primary focus was creating an adhesion complex that was suitable to quantitative testing using the Material Testing System (MTS). This led to several improvements on the initial idea that included improved stabilization technique, testing area, and injury precision. The MTS measures force per displacement which can be quantitatively analyzed and interpreted.

Result: This model is unique and advantageous in its ability to quantitatively assess the strength of the adhesion complex. Our assessments showed that previous grading methods were neither consistent nor accurate when compared to mechanical results. Our model minimizes the potential for bias with quantitative testing. This method of assessing adhesion strength can now be used to test current industry standard barriers and newly developed novel compounds and methods of adhesion prevention.

Researcher: Cheng Ching Chiang, Dr. Judit Puskas, and Dr. Chrys Wesdemiotis

Institution: University of Akron

Faculty Mentor: Dr. Judit Puskas

Synthesis of a Polyisobutylene-Farnesyl Pyrophosphate Macroinitiator for in vitro Synthesis of Polyisobutylene-b-cis-1,4-polyisoprene

Research in biochemistry revealed that the biosynthesis of polyisoprenoids and terpenes proceeds through carbocationic polymerization. Recently, Puskas et al. proposed that natural rubber (cis-1,4 polyisoprene, NR) biosynthesis also proceeds via a carbocationic mechanism.¹ To develop a better understanding of this process, a synthetic macroinitiator analogue of nature's initiator, farnesyl pyrophosphate (FPP), will be employed in an in vitro NR biosynthesis system to produce PIB-block-NR, in collaboration with the United States Department of Agriculture (USDA). This work discusses the first four steps of the synthesis of the polyisobutylene-farnesyl pyrophosphate (PIB-FPP) macroinitiator. The expected structure of the intermediates was confirmed by nuclear magnetic resonance (NMR) spectroscopy and matrix-assisted laser desorption/ionization – time of flight (MALDI-TOF) mass spectrometry.

1Puskas, J. E.; Gautriaud, E.; Deffieux, A.; Kennedy, J. P. Progress in Polymer Science 2006, 31, 533-548.

Researcher: Victoria Corell

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Sutter

Overweight/Obesity Awareness

Overweight and obesity are serious, chronic, preventable disease. Each year, obesity causes at least 300,000 excess deaths in the U.S. and associated health care costs amount to approximately \$100 billion.

As caregiver and a student Nurse Practitioner constantly involved in the care of patients, this project is about screening for the overweight/obese patients with the use of body mass index (BMI). BMI is an index of weight adjusted for the height of an individual. The height and weight will be measured in each patient, and the BMI will be calculated, and with this process we will be able to identify who is at increased risk for mortality and morbidity due to their weight. Once identified, specific recommendations about diet, increased physical activity and behavior modification will be provided.

Target population would be from 20-65 years of age. Excluded are patients who are on steroids, muscular/athletic types, those with advanced type of heart, respiratory, arthritic condition, and those with fractures of their lower extremities. Main goal of this project is to reduce body weight. Data collection will be for a period of 8 weeks. .

Researcher: David Dabney, Michael Polce, and Chrys Wesdemiotis

Institution: University of Akron

Faculty Mentor: Dr. Chrys Wesdemiotis

Characterization of Polypropylene Homopolymers by Mild Pyrolysis and MALDI-ToF-Mass Spectrometry

Due to the saturated nature of polypropylene, (PP), traditional mass spectrometry, (MS), techniques do not yield spectra. MS techniques have been used, however, in conjunction with pyrolysis techniques to elucidate the degradation mechanisms of this polymer. Minimal work has been conducted utilizing mild pyrolysis (< 400° C) in conjunction with MALDI-ToF-MS as a tool to characterize and differentiate various homopolymeric PP's. In this study, we attempt to differentiate, atactic, syndiotactic and isotactic controls from one another as well as between several commercial homopolymeric PP's with these techniques.

Preliminary results have been obtained using PP standards; atactic (Mn ~ 3700), isotactic (Mn ~ 5000 and Mn ~ 50,000), syndiotactic (Mn~ 50,000) and three commercial PP homopolymers of unknown molecular weight. Milligram samples were placed into sealed or unsealed NMR tubes and pyrolyzed at 300°C for up to 90 minutes. The pyrolyzates were then dissolved in 1,2,4-trichlorobenzene at 160°C for 15 minutes. MALDI-ToF-MS samples were prepared by mixing matrix/sample/salt solutions in the ratio of 14:4:1. The matrix was dithranol (10mg/ml), and the cationizing agent was AgTFA (10mg/ml). Mass spectra were acquired on a Bruker Reflex III ToF mass spectrometer.

Researcher: Erin Daly

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Sutter

Getting with Guidelines for Diabetes Management

Diabetes, a chronic disease, has multiple complications that arise from poor control of this disease and account for the significant increased morbidity and mortality associated with this diagnosis. Guidelines have been developed to screen for a patients risk of developing these complications which allows for early treatment to prevent further damage to the body. It is essential that primary care providers consistently utilize these guidelines. The literature indicates that diabetes management programs utilizing these guidelines are promising interventions that will increase the number of patients who are receiving the recommended screening.

As a student nurse practitioner in a physician's office I will implement the Diabetic Flow Sheet tool. It offers a place for patient's history of diabetes and a table to document specific screening tests performed at each quarterly visit. It will be placed in 5-10 patient charts who meet the criteria for the study and who are seen in the primary care office site of my clinical in the spring semester of 2008. I will compare the effectiveness of this tool in improving provider compliance with national guidelines and patient outcomes with the tool currently being used at my clinical site.

Researcher: Heidi Daugherty
Institution: University of Akron
Faculty Mentor: Dr. Carolyn Sutter

Metabolic Syndrome: How Can Nurse Practitioners Improve Patient Outcomes?

Metabolic Syndrome has recently come under scrutiny for its role in the development of chronic diseases. Current research focuses on the impact of Metabolic Syndrome with pre-existing medical conditions, as well as from a preventive standpoint, and the total risk reduction for future cardiovascular complications. Metabolic Syndrome includes the components of central obesity, dyslipidemia, high blood pressure, and high fasting plasma glucose. One of the most important roles of the Nurse Practitioner is preventive health visits and patient education. A simple screening tool could be utilized by Nurse Practitioners to quickly and easily identify those who meet the criteria for Metabolic Syndrome. Upon identification of those patients, efforts could be made to prevent or help reduce the risks associated with the individual components of this condition. The individual components are health risks in themselves, but when present together, appear to work synergistically towards the development of cardiovascular and diabetic complications.

The purpose of this study is to develop and implement an easy-to-use tool that can identify patients with Metabolic Syndrome. A small population of patients will be utilized to trial and evaluate the effectiveness of the tool. The study will take place in a large primary care office in Northeastern Ohio.

Researcher: Barbara Daum
Institution: University of Akron
Faculty Mentor: Dr. Carolyn Sutter

Antibiotic Resistance

Upper respiratory symptoms are among the most common reasons patients seek care. Usually, it is not debated that viruses cause common colds and influenza. However, the majority of upper respiratory infections are viral in origin. Even though they are not indicated, antibiotics are prescribed to more than half of patients with upper respiratory symptoms. It is this misuse and overuse of antibiotics that causes the majority of antibiotic resistance (AR), a worldwide public health threat. Although guidelines have been developed for practitioners, little success has been made in decreasing the number of antibiotic prescriptions written. The center for disease control and prevention (CDC) created a prescription pad for patient education. As an adult nurse practitioner in a primary care office, I am going to review this information with four or five patients who have symptoms that do not require antibiotics. At the time of the visit, I will evaluate the patients' response to the prescription and my explanation. Patients must be educated about the cause of their symptoms and when antibiotics are appropriate. If the incidence of AR is ever going to be reduced, it is imperative to control the utilization of antibiotics, especially for upper respiratory symptoms.

Researcher: Lisa Davis
Institution: University of Akron
Faculty Mentor: Dr. Marguerite DiMarco

Fever Phobia. Does it still exist?

Schmitt (1980) coined the well known term "fever phobia" which described caregivers' lack of understanding of fever, proper detection and caused parents to make unnecessary appointments. Assessment of families' beliefs, perceptions and educational level on temperature, is imperative for

treatment. A healthy approach towards the care of the child with a fever, will lead to health-promoting behavior. Nola Pender's Health Promotion Model will be utilized to target parental knowledge, attitudes, anxiety and the appropriate practice for fever management.

The project examines families' knowledge, beliefs and treatment of febrile events with two diverse populations (homeless shelter families and suburban families) using a pretest/posttest method. Beliefs, fears/knowledge of the caregiver will be assessed using a pretest evaluating the understanding of thermometers, beliefs/fevers in their children. The program discusses proper use of a thermometer, a "traffic light" tool on fevers: truth and myths and a short review. A posttest to examine the caregiver's knowledge gained and/or beliefs changed will be given. Statistical analysis will use paired t tests.

The project may lead to a better understanding of the treatment of fever, unnecessary emergency department visits, office visits and improved health.

Researcher: William Davis
Institution: University of Akron
Faculty Mentor: Dr. Jean Pan

Using Lichens to Look into Akron's Polluted Past

Due to different sensitivities to air pollution in different lichen species, the diversity of lichen communities can be used to monitor the effects of air pollutants, mainly SO₂, NO_x, and heavy metals. As the amount of pollution increases, lichen diversity decreases. Although SO₂ levels around Akron have fallen, lichen communities can still be used to monitor other pollutants, such as NO_x. However, the effect of these other pollutants might be masked by the patterns of diversity caused by the former SO₂ levels. This study plans to use geographically weighted regression to analyze the influence of SO₂ levels from 1968 to 1971 and environmental factors such as light, moisture, and elevation on the lichen communities around Akron.

Researcher: Amy DuPont
Institution: University of Akron
Faculty Mentor: Dr. Carolyn Sutter

Vitamin D Insufficiency

Current research shows an associated link between multiple diseases (cancer, autoimmune disorders, gastrointestinal disorders, depression, and etc) and vitamin D deficiency. Many Americans are unaware that they are vitamin D deficient. Living in the north eastern portion of the United States places us at an increased risk for vitamin D deficiency, due to the natural deficits of sunlight. Plus, most Americans are unable to meet their recommended dose of vitamin D through diet alone. The purpose of this paper is to determine if the routine screening of vitamin D levels is necessary in primary care. Currently no guidelines exist for the recommended routine screening for vitamin D insufficiency. If specific recommendations are developed, we may be able to prevent the needless suffering of people and improve the quality of health to those we serve.

Researcher: James Durbin
Institution: University of Akron
Faculty Mentor: Dr. Carolyn Anderson

Leadership and Nonverbal Communication: A Current Update

Prior research in the area of nonverbal leadership behaviors is lacking in the sense that less than a half dozen articles exist that are true examinations of nonverbal behaviors displayed by leaders. This study builds on this area and fills in some of the gaps that exist. This study particularly examined the nonverbal behaviors that organizational leaders say they use. Specifically how the nonverbal behaviors used by leaders toward their subordinates differed depending on the gender, the type and size of organization, and also the number of individuals they lead.

Researcher: Jennifer Eggert and Dr. Laura Crouse

Institution: University of Akron

Faculty Mentor: Dr. Peg DiMarco

Preschoolers Play a Hand in Infection Control

Preschool children attending a childcare center are at greater risk for contracting viral infections, and utilize healthcare services at an increased rate compared to preschoolers cared at home. Daycare/preschool employees are trained to perform proper hand hygiene since hand washing is the single most important preventative action for reducing the transmission of disease. Child to child contact, either direct or indirect, is unavoidable, thus playing a key role in the transmission of infection among preschoolers.

The purpose of this project is to increase the preschool-aged child's awareness of how viruses are transmitted, and provide age-appropriate activities demonstrating preventative measures they can employ independently, such as proper hand hygiene, to decrease their risk for contracting and transmitting infections. The project will take place in a preschool classroom setting, with a target population age group of four/five year olds. The project is based on Erikson's Stages of Psychosocial Development. According to Erikson, preschoolers need to take initiative when completing tasks. A simple picture pre/post test will be used before and after the demonstration of glow material on preschoolers' hands touching various surfaces showing how germs are spread. Chi square tests will be used. Hand washing by preschoolers may help decrease infections.

Researcher: Maria Veronica Elias

Institution: University of Akron

Faculty Mentor: Dr. Ralph Hummel

"Experiencing Community Process: The Dynamics of Community Improvement in Selected Akron-Area Neighborhood Groups"

The Public Administration literature at large looks at "community" from the outside in a static way as if it were an object, an immutable entity. My interest lies in the lived process of participating in community as a foundation for democratic politics. This seems to require searching out the meanings that people attach to "community" when they use it to describe their experiences of living with one another in a way that shapes their civic engagement experiences. For this purpose I will focus on one of the theorists seeing community as a process. This is Mary Parker Follett; the work is her *The New State*, 1920. The main phenomenological question underlying my research is: What does community mean to people who live in one? My motivation leads my investigation; that is, my own experience of political un-freedom in Argentina is the trigger that has led me to inquire into the nature of the relationship between community and democracy.

We do not know a whole deal about how people get involved in collaborative practices as they experience them on a daily basis, simply because we have hardly ever asked them directly for their opinions in a way that we would consider them a "reliable" approach to our research inquiry. There is, therefore, a research gap in what concerns community as a process, and even a wider gap when

it comes to epistemological considerations. This study presents a seldom visited research approach, that of the phenomenological logic of inquiry (Husserl 1962, Schutz 1970), which finds its roots in people's experiences.

Researcher: Ashley Farrish

Institution: University of Akron

Faculty Mentor: Dr. Susan Witt

The Effects of Multiple Placements on Children in Foster Care

The purpose of the review of research for this project is to analyze the characteristics of successful programs for youth aging out of the foster care system. Literature was reviewed concerning youth in foster care and their educational opportunities which are affected by the number of placements that they experience. The literature review revealed many programs which are targeted to children in foster care and helping them emancipate successfully. Because of the sensitive nature of the topic it was decided to analyze studies that have been conducted rather than work with human subjects. Research on children in foster care is a sensitive area that can be limited at times due to the legal rights of youth in foster care, their parents, and social workers. The number of placements that a child is in while in foster care greatly impacts his or her life. When youth in foster care leave different homes they also leave school districts, forcing them to leave behind set after set of schools and social networks. When youth move from home to home they may experience varying degrees of educational quality and often emotional difficulties.

The topic of this research project is the impact of intervention programming on the successful outcomes for youth in foster care. The study will involve a review of the literature and evaluation of existing programs to determine the qualities that appear to best predict successful programming for this population. Many of these children in foster care become adults, who lack education, have mental illnesses, and frequently become homeless. This research paper will focus intensively on the opportunities that are given to children who are in foster care in the U.S.

Researcher: Lei Feng

Institution: University of Akron

Faculty Mentor: Dr. Kevin Cavicchi

Hydrolysis and Condensation of Triethoxysilyl End-Functionalized Polyisoprene Using Phase Transfer Catalysts

Polymers with unique architectures have unique properties useful in a number of different applications. One example is a star polymer. This report describes the synthesis of alkoxy-silyl end functional polyisoprene polymers and hydrolysis and condensation of the end groups to produce star polymers. Triethoxysilyl end-functionalized polyisoprene was synthesized using sec-BuLi initiated living anionic polymerization terminated with tetraethoxysilane. NMR spectroscopy showed successful end-capping with the triethoxysilyl functional group. Hydrolysis and condensation of triethoxysilyl functionalized polyisoprene was performed using a phase transfer catalyst under basic conditions to form a star polymer in organic solvent. Size exclusion chromatography showed that star polymer was obtained but uncondensed precursor polymer remained. The amount of star polymer produced was found to be non-monotonic with time, with maximum conversion obtained at intermediate reaction times. The optimization of the reaction conditions to drive the equilibration of the hydrolysis and condensation reactions towards star formation will be discussed.

Researcher: Li Feng
Institution: University of Akron
Faculty Mentor: Dr. Kevin Cavicchi

Synthesis of conductive block copolymers for organic photovoltaic devices

Photovoltaic devices made of organic materials are attractive candidates for providing cheap, clean, and renewable energy. A challenge in photovoltaic research is to increase the efficiency of these devices. The focus of this research is the synthesis of block copolymers with hole-conducting and electron conducting blocks. The self-assembly of the block copolymer into ordered nanostructures combined with their interaction with electrode surfaces should allow the fabrication of thin films with interpenetrating bilayer morphologies. These morphologies will improve the efficiency of the photovoltaic devices greatly by optimizing the generation and dissociation of excitons over the entire volume of the device.

Researcher: Marta Flood
Institution: University of Akron
Faculty Mentor: Dr. Carolyn Sutter

Dyslipidemia and Hypothyroidism

Cardiac disease is the leading cause of death in the United States. Dyslipidemia is a risk factor for cardiac disease and therefore treated with therapeutic lifestyle changes (TLC) and cholesterol reducing agents. Hypothyroidism is associated with abnormal lipid levels. Recommendations for thyroid screening are inconsistent among professional associations. The signs and symptoms of hypothyroidism are reversed with thyroid hormone medication. Lipid levels have been reduced in patients with hypothyroidism receiving treatment. This may result in a decrease of coronary artery disease (CAD). The purpose of the study is to test a tool to use in a clinical setting that will identify hypothyroidism among patients with dyslipidemia. Ten patients presenting to a local government subsidized clinic in a large metropolitan area will be screened using the tool. The thyroid screening tool will identify sub clinical or overt hypothyroidism in patients presenting with abnormal lipid levels. !

This tool is important to assist Practitioners in identifying treatable causes for abnormal lipid levels. More studies will need to be conducted to determine improvements in patient lipid levels after hypothyroidism treatment as well as reduced risk of cardiovascular disease.

Researcher: Ryan Folk
Institution: University of Akron
Faculty Mentor: Dr. Donald Ott

The Morphology of the Jaw of the Parasitic Rotifer, *Proales werneckii*

The morphology of the jaw of the rotifer *Proales werneckii* (Ehrenberg, 1834) (Ploimida: Proalidae) is documented for the first time using light and scanning electron microscopy. *P. werneckii* is parasitic upon several species of the filamentous, coenocytic Xanthophyte, *Vaucheria*, entering a gametophore or an apical growing tip and forming a large, cylindrical side branch (gall). The rotifer lives in the vacuole of this gall for the rest of its life and feeds by piercing the vacuole membrane to access the cytoplasm. The organelles and cytoplasm of the host organism are pulled by beating cilia on the corona (mouth) into the muscular mastax or pharynx, in which the trophi, a complex calcified jaw, is situated. We hypothesize that the morphology of the jaw reflects the parasitic lifestyle and will show significant differences from the jaws of free-living rotifers. We found that the rami (central two pieces) on the jaw were highly reduced in size, and that the unci

and manubria (lateral, wishbone-shaped pieces) were large and well-developed compared to other rotifers. The morphology of the jaw plays an important role in the identification and classification of the rotifers.

Researcher: Elizabeth Foreman
Institution: University of Akron
Faculty Mentor: Dr. Judit Puskas

BIOCOMPATIBILITY STUDIES OF NOVEL POLYISOBUTYLENE-BASED BIOMATERIALS

High molecular weight arborescent polyisobutylene-b-poly(p-methylstyrene) block copolymers with hydroxyl functionalized polyisobutylene (arbIB(OH)-MS) have been produced by inimer type living carbocationic copolymerization of 4-(1,2-oxirane-isopropyl) styrene inimer (initiator-monomer, EPOIM) with isobutylene (IB) using TiCl₄ as coinitiator. arbIBS polymers are in the third generation of polyisobutylene-based biomaterials. Polymers were purified by exhaustive Soxhlet extraction using hexane, methyl ethyl ketone and ethanol. Purified polymers, non purified polymers, and polymers compounded with 37.5wt% N 234 carbon black were implanted using medical grade silicone as a comparison. Micro dumbbells were implanted in the soft tissue of the abdominal wall, into the bone and into muscles of rabbits for 180 days. The unchanged morphology of rabbit liver hepatocytes and the lack of parenchymal necrosis also indicated that exposure to the investigated polymers did not cause any cytotoxic reactions. The polymer with carbon black was found to have a thinner capsule than medical grade silicone.

Researcher: Emily Frank, Alyison Leigh, Sara Whitson, and Dr. Chrys Wesdemiotis
Institution: University of Akron
Faculty Mentor: Dr. Chrys Wesdemiotis

Peptide Fragmentation of Natural and Non-naturally Occurring Amino Acids

Peptide fragmentation can yield primary sequence information about unknown peptides based on their fragmentation patterns and has been useful in determining modifications and their locations on peptides of interest. Several models exist to explain peptide fragmentation; such as the mobile proton model, which is the most applicable to this research. Tandem mass spectrometry (MS/MS) data interpretation is assisted by databases, such as Protein Prospector. By inputting the peptide of interest, selecting the ions of interest as well as noting any modifications on amino acids found in the peptide and the instrument used to collect the data, one can retrieve an in-silico fragmentation of the peptide of interest.

This study focuses on analyzing five commercially available natural and non-natural peptides using a Bruker-Esquire-LC Quadrupole Ion Trap (QIT) mass spectrometer to determine their fragmentation patterns. Peptides were dissolved at 1 mg/mL in an acetonitrile:water mixture with water spiked with 0.1% acetic acid (v:v); the acid facilitated protonation for MS analysis. All solvents were HPLC grade.

Researcher: Belinda Franko
Institution: University of Akron
Faculty Mentor: Dr. John Szabo

Differentiation and Origin of Pink Inclusions in Glacial Sediments in Eastern Ohio

Researchers, who have mapped glacial sediments within the glaciated portion of the Allegheny Plateau, have noted the occurrence of isolated diamicts having a pink color and containing more

carbonate minerals than their surrounding gray diamicts. A large continuous exposure in a strip mine near North Lima, Mahoning County, Ohio, provides an opportunity to examine the physical relationship of pink diamicts to gray ones. The matrix texture (% < 2 mm), carbonate (% < 0.074 mm) and clay mineralogy, and elemental composition of samples of pink and gray diamicts were examined for major differences. More variation was found in the sand fractions of gray samples than in those of pink samples. Pink diamicts have more total carbonate in the medium-sand to silt fractions than gray diamicts. X-ray diffraction intensity ratios (DI) average 1.1 for pink diamicts and 0.9 for gray diamicts. A 32-element chemical analysis of both the sand and fine fractions shows that composition of pink diamicts differs significantly from that of gray. Geometry and laboratory analysis of diamicts at this site suggest that pink diamicts have a source in the Queenston and Grimsby formations of the Niagara Peninsula

Researcher: Nicole Gaitanos
Institution: University of Akron
Faculty Mentor: Dr. David Ritchey

Kling Street Crisis

Over the past several months there have been a series of robberies and sexual assaults on Kling Street in Akron, Ohio, near The University of Akron campus. This is a major public relations crisis for The University of Akron because students and parents do not feel the campus is safe. If this problem is not handled correctly enrollment could drop at the university affecting both university programs and income negatively.

A robbery victim comments on the reasons as to why she chose to stay in her apartment after being robbed and if she feels that the university's crisis plan was affective in helping ease the worries of the students. The university's communication department also comments on the effectiveness of the current crisis public relations plan.

The main concern of The University of Akron should be how to assure the public that all the necessary steps are being taken to prevent such a situation from occurring in the future as well as assuring the public that the current crisis plan is affective.

Researcher: Rosa Githiora and Linda Githiora
Institution: University of Akron
Faculty Mentor: Dr. Rajade Berry-James

Female Genital Mutilation in Africa: A Human Rights Issue

Female Genital Mutilation (FGM) is a Human Rights Issue that encroaches on women's enjoyment of their personal freedoms. "The World Health Organization estimates 130 million girls and women in Africa alone suffer the physical and psychological effects of some form of FGM."(WHO, 1997) "Approximately 2 million girls are mutilated every year. Egypt, Ethiopia, Kenya, Nigeria, Somalia, and the Sudan account for 75% of all cases. In Djibouti and Somalia, 98% of girls are mutilated."(Toubia, 1996) Why does Female Genital Mutilation continue despite set legislation and advocacy aimed at curbing this practice? Examining the prevalence of Female Genital Mutilation in Africa in relation to the health, administrative and policy implications plays a vital role in its eradication.

Researcher: Harish Gopalan
Institution: University of Akron
Faculty Mentor: Dr. Alex Povitsky

Numerical Modeling of Aerodynamics of airfoils of Micro Air Vehicles in Gusty Environment

The superior flight characteristics exhibited by birds and insects can be taken as a prototype of the most perfect form of flying machine ever created. Design of Micro Air Vehicles (MAV) is one of the most interesting application trying to mimic the bird and insect flight. The size and speed of operation of a MAV results in low Reynolds number flight, way below the flying conditions of a conventional aircraft. The insensitivity to wind shear and gust is one of the most important requirements in a MAV aerodynamic design. The wind shear and gust conditions are successfully overcome in the flight of birds and insects. Birds and insects achieve the aerodynamic performance of their flight by the flapping motion of their wings. This observation of flapping wings has resulted in numerous analytical/numerical and experimental studies which try to model the flapping motion of the birds and insects. Majority of the studies have neglected the effect of wind shear and gust. In the current study, the effect of the wind gust on the aerodynamic performance of a 2D plunging airfoil is examined numerically using a Navier-Stokes solver. The Navier-Stokes (Euler) solver has been validated against benchmark problems in Computational Aeroacoustics (CAA), Classical Computational Fluid Dynamics (CFD), oscillating airfoil experiments and flow visualization of Air Force Research Laboratory, Dayton (Dr. Ol) .The possible suppression of wind gust using pitching and plunging motion of the airfoil is discussed.

Researcher: Julie Gouin
Institution: University of Akron
Faculty Mentor: Dr. John Peck

Tidal Rhythmites: A Study of an Ancient Ohio Tidal Environment

This honors research project studies rhythmically-layered Pennsylvanian sedimentary rocks from northeast Ohio to determine if they were tidally influenced during deposition. These are known as tidalites and would help create a better understanding of the paleo-environment. During the Pennsylvanian period, Ohio was located near the equator with fluctuations in environment ranging from shallow marine to deltaic and fluvial.

Two drill cores of rhythmically laminated shales and sandstones from East Fairfield Coal Company were imaged and lamina thickness was measured. A down-core sinusoidal variation in lamina thickness is present. This cycle repeats about every 14 laminae in one core and about every 26 laminae in the core. This repeated pattern in thickness variation suggests tidal influence on the depositional environment. A 14 laminae cycle suggests one deposit per day (a diurnal tidal pattern) and the 26 laminae cycle suggests two deposits per day (a semidiurnal tidal pattern). The position of depositional the site in relation to the tidal range can also influence the number of lamina deposits per day. The thickness of the deposits will vary depending on the range of the tide, thicker deposits during spring tide and thinner deposits during neap tide.

Researcher: Courtney Gras, Jeff Aynes, Michael Beavers, kyle Hamblin, James Kirkwood, Lindsay Leyo, Michael Ludwig, and Michael Prechel
Institution: University of Akron
Faculty Mentor: Dr. Tom Hartley

The Space Elevator Concept with Robotics

The Space Elevator is an ongoing project that researchers, scientists, and engineers are collectively developing. The main goal is to construct a tether between earth and some object in space, on which a number of vehicles can travel. These vehicles will be controlled by electric motors, and powered through a beamed light source. The vehicles will be used to lift packages much heavier than the payloads currently carried by space shuttles. The elevator will travel at 120mph, and will stretch 62,000 miles long. With a space elevator constructed, human space exploration will be taken to new level.

Our research team has studied the topic of space elevators, and implemented the design using robotics. This autonomous model has been designed to perform the tasks required by the real space elevator concept. Our robot is capable of operating on a beamed power source while carrying a payload. All aspects of our project have been developed from the ideas of others, but implemented using design and construction concepts exclusive to our team. The main purpose of our research is to explore the undeveloped ideas of science and engineering, and implement those ideas in a realistic model form.

Researcher: Amy Grebenstein

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Sutter

Assessment of the Diabetic Foot

Diabetes is the leading cause of lower limb amputation, caused by foot ulcers and gangrene. Physicians caring for patients with type 2 diabetes often do not adequately conduct recommended screenings for diabetes-related conditions (Beckman, 2004, p. 19). With appropriate knowledge of risk factors and treatment by a multidisciplinary team, up to 85% of foot and leg amputations in diabetic patients could be prevented (Muha, 1999, p 1).

The Annual Comprehensive Diabetes Foot Exam Form is the tool I will implement this semester at my clinical site. By placing this examination tool on the chart, it will be easy to see if the patient had a foot check done at least yearly and easy to see the problems they have had in the past. Diabetic patients between the ages of 18-70 will have their feet examined during a routine office visit, using the Annual Comprehensive Diabetes Foot Exam Form. The HELP mnemonic is another way to organize and recall these measures (Beckman, 2004, p20). Patient education regarding foot hygiene, nail care, and proper footwear is crucial to reducing the risk of injury that can lead to ulcer formation (Armstrong & Lavery).

Researcher: Soma Guhathakurta

Institution: University of Akron

Faculty Mentor: Dr. Kyonsuku Min

Development of Anhydrous Proton Conducting Polyelectrolytes Based on Sulfonated Bisphenol A Polyetherimide and 1H-1,2,4 Triazole

The sulfonated polyelectrolytes have received considerable interests in recent years because of their wide variety of applications in electrochemical cells. Proton conduction in the sulfonated polymers takes place in a second liquid phase, commonly in water. Conductivity decreases drastically above 80°C due to the evaporation of water from the matrix. In this study, sulfonated bisphenol A polyetherimides with various sulfonation level were synthesized and characterized. 1H-1,2,4-triazole was used as proton solvent to promote proton conductivity in the anhydrous state due to its higher boiling point (~256 °C) compared to water. The effect of degree of sulfonation and

triazole concentration on proton conductivity and morphology of the blends were examined. The strong interaction between the sulfonic acid groups and the triazole molecules showed high proton conductivity $\sim 2.46 \times 10^{-4}$ S/cm at 300C and 10^{-2} S/cm at 1400C and had significant effect on the crystallization behavior of triazole.

Researcher: Christen Gunder
Institution: University of Akron
Faculty Mentor: Dr. Carolyn Sutter

PolyPharmacy: A Safety Issue in Primary Care

In this day and age of medication management, primary care is faced with the number one safety issue today, polypharmacy. Multiple medications may be required for many diseases, but detrimental outcomes and personal financial burden play a role in polypharmacy. Risk factors such as age, multiple providers, unclear instructions, co-morbidities of illness, multiple pharmacy use, and lack of education contributes to this detrimental problem. Protection is warranted to decrease the incidents of polypharmacy in the primary care setting. Intervention used in this paper to prevent polypharmacy will consist of a paper tool which includes important personal information that is portable to every appointment and kept easily in the wallet. Patients who use multiple providers will be given this tool and instructed on its use. Patients will show this tool at every office visit and every provider in an attempt to eradicate polypharmacy. This paper will address a definition of polypharmacy, its dangerous impact on patients, and the importance of updated patient medication records in primary care.

Researcher: I. Sedat Gunes
Institution: University of Akron
Faculty Mentor: Dr. Sadhan Jana

Evaluation of Nanoparticulate Fillers For Development of Shape Memory Polyurethane Nanocomposites

Shape memory polymer is a stimuli responsive material, which may recover its original shape after severe deformation and extended period of cold hibernation. Our research focus is on the use of nanoparticulate fillers to augment shape memory properties. Selected matrix material is a multi-phase shape memory polyurethane with crystallizable soft segments. Performances of three different nanofillers, organoclay, carbon nanofiber (CNF), and silicon carbide (SiC) are compared with that of a conventional filler, carbon black (CB). Our results indicate that exfoliated organoclay and CB slightly decreases soft segment crystallinity, whereas CNF and SiC significantly decrease that even at low loading levels. To gain more insight on the underlying mechanisms of these observations, rheological testing, surface characterization using X-ray photoelectron spectroscopy (XPS) and morphological analysis using transmission electron microscopy (TEM) and scanning electron microscopy (SEM) are performed. It is determined that surface properties, size, geometry and loading level of filler are crucial factors which may cause interference with soft segment crystallinity. Consequently, exfoliated organoclay augments shape memory (SM) performance significantly, while other fillers diminish it. Better SM properties with organoclay can be attributed to mechanical reinforcement without interfering with crystallinity.

Researcher: Kaan Gunes and Dr. Avraam I. Isayev
Institution: University of Akron
Faculty Mentor: Dr. Avraam Isayev

Ultrasonic Treatment of PEN/LCP Blends During Extrusion

Ultrasonic extrusion of blends of wholly aromatic liquid crystalline polymer (LCP) and polyethylene naphthalate (PEN) was studied. Rheological, thermal, mechanical and morphological characterization of the blends was performed. The viscosity of untreated PEN was greater than the viscosity of untreated LCP, while viscosity of the untreated blends varied with composition and was between those of the components. PEN treated at high ultrasonic amplitudes showed lower viscosity and glass transition temperature, indicating degradation under action of ultrasound. The modulus and tensile strength of untreated PEN/LCP blends improved substantially with addition of LCP, while the elongation at yield and impact strength decreased. In situ created LCP nanosize fibrils in the skin region, and LCP droplets in the core region were observed in injection moldings of PEN/LCP blends. However, lack of adhesion between the LCP and PEN phases was evident, and was not improved with ultrasonic treatment. LCP fibril size increased at high ultrasonic amplitudes due to the lower viscosity of treated PEN. The latter led to reduced mechanical properties of blends.

Researcher: Rami Haddad

Institution: University of Akron

Faculty Mentor: Dr. Igor Tsukerman

Performance Monitoring for Automated Robust Optical Fiber Networks Using Bit-stream Distribution Approximation

Wavelength division multiplexed (WDM) optical networks are the backbone of the current generation information superhighway. Rapid growth of internet and wireless applications is beginning to outgrow the capacity available on the existing information superhighway consisting of conglomeration of optical fiber and amplifiers under the ground and in the ocean. Therefore, this demand is pushing towards better performance and higher capacity on both existing and future optical fiber networks which shrinks the window of operability in managing these networks making automation and monitoring a vital factor in network performance and reliability. The suggested Monitoring technique will target the long-haul and Metropolitan WDM networks where the performance is the major hurdle due to degrading effects accumulating while information carrying light travels down the fiber. The discussed technique will help monitor the performance on existing and future WDM systems by using some statistical analysis modeling techniques without the need of any extra added components or major changes in the network infrastructure. The result will be a fully automated network with the capability of fully compensating for chromatic dispersion effects in the optical fiber networks.

Researcher: Anna Hamilton

Institution: University of Akron

Faculty Mentor: Dr. Maria Zanetta

Searching for a World Without Gender Hierarchy in Post-Civil War Spain: An Examination of the Work of Remedios Varo and Mercè Rodoreda

Under the dictatorship of Francisco Franco, many artists and writers were exiled because their ideology did not coincide with Fascist ideology. Women particularly suffered a type of double exile due not only to their subversive principles but also because they were women and submissive. This isolated group of women wanted to express, based upon their personal experiences, exactly what it meant to be a woman. These identities propose a more balanced society between men and women. In Mercè Rodoreda's novel, *La plaza del diamante* (1962) various themes support the movement against socially imposed gender roles. The recovery of a missing matrilineal tradition, fear of failure, public space, indirect rebellion and the theme of the androgynous figure are recurrent themes in Rodoreda's novel. In the artwork of Remedios Varo, these themes and others support and substantiate the same thesis. To prove the feminist intention of both women, I will analyze muted

group theory, the motif of the androgynous figure, and various theories that examine the absent mother and lack of matrilineal tradition. These themes from the novel and paintings demonstrate the indirect rebellion employed by both women in their work.

Researcher: Serap Hayat

Institution: University of Akron

Faculty Mentor: Dr. Judit Puskas

Synthesis of Star-branched Polyisobutylenes from Hexaepoxysqualene

The synthesis of star-branched polyisobutylenes (PIBs) was achieved by carbocationic polymerization of isobutylene (IB) initiated by a six-functional epoxy initiator, namely hexaepoxysqualene (HES), in conjunction with BCl₃ and TiCl₄ as a coinitiator. Understanding the initiation mechanism from an epoxide was crucial to be able to control the initiation from all six sites of HES simultaneously. Initiation from epoxy/Lewis acid (LA) systems and polymerization of IB using these initiating systems were investigated by real-time FTIR monitoring of the initiation and polymerization from single-site epoxy initiators, namely 1,2-epoxy-2,4,4-trimethyl-pentane (TMPO-1), 2,3-epoxy-2,4,4-trimethyl-pentane (TMPO-2), alpha-methyl styrene epoxide (MSE) in conjunction various LAs (TiCl₄, BCl₃). Our research group published earlier that TiCl₄ is an efficient Lewis acid with the aromatic epoxy initiator MSE, giving 40 % initiator efficiency, whereas only 3 and 10 % efficiency was found with the aliphatic initiators TMPO-1 and TMPO-2, respectively. Recently it was found that BCl₃ is more efficient with the aliphatic initiator TMPO-1, yielding 70 % initiator efficiency, while MSE gave only 1-4 % efficiency. The HES/BCl₃ system resulted in ~90 % initiator efficiency yielding low molecular weight star PIBs with ~ 6 arms per HES.

Researcher: Brittany Heflin, Laura Young, and Dr. Richard Londraville

Institution: University of Akron

Faculty Mentor: Dr. Richard Londraville

Temperature Effects on Crypsis in Entomacrodus Striatus

The blackspotted rockskipper, *Entomacrodus striatus*, is a resident of the South Pacific intertidal and changes skin color when placed on different colored substrates. Due to the highly variable conditions recorded in the intertidal zone, we tested the effect of temperature on the fish's ability to change color. Rockskippers were placed in a black box for thirty minutes while digital photographs were taken at three minute intervals. The photos were analyzed for pixel density with imaging software. This process was repeated at two different temperatures (31°C and 27°C) representing the average high and low temperatures recorded in the intertidal zone. There were no significant differences in the maximal, minimal, or time to peak pigmentation at the two temperatures, leading to the assumption cryptic color change is temperature independent. However, an oscillating pattern of pigmentation, with significant autocorrelation, was observed over time. Movement of pigment cells is ATP-dependent; thus we propose that cycling pigment density results in conservation of energy.

Researcher: Andrew Heidenreich, Alina Alb, Wayne Reed, and Judit Puskas

Institution: University of Akron

Faculty Mentor: Dr. Judit Puskas

Online Monitoring of the Inimer-Type Raft polymerization of Styrene Mediated by Vinybenzyl Dithiobenzoate

Arborescent (dendritic or tree-like) polystyrenes were prepared using an inimer (initiator – monomer)-type living polymerization based on reversible addition-fragmentation chain transfer

(RAFT). These polymerizations were mediated by the dithioester inimer, vinylbenzyl dithiobenzoate, which contains a dithioester group and a polymerizable double bond. The polymerizations were monitored online using Automatic Continuous Online Monitoring of polymerization reactions (ACOMP). This system allows for the simultaneous monitoring of conversion, weight-average molar mass M_w , and intrinsic viscosity. Preliminary data suggest characteristics associated with effective inimer-type polymerizations, such as an increase in M_w/M_n with conversion, and much higher molar masses than would be expected for linear chain growth.

Researcher: Priscilla Hope and Jason Bowling

Institution: University of Akron

Faculty Mentor: Dr. Kathy Liszka

Spam Image Identification Using an Artificial Neural Network

Email spam has been a menace since its inception. Even as anti-spam software producers think they have almost solved the problem, spammers come out with new techniques. One such tactic in the spammers' toolbox comes in the form of image spam – messages that contain little more than a link to an image rendered in an HTML mail reader. The image typically contains the spam message one hopes to avoid, yet it's able to bypass most filters due to the composition and format of these pictures.

This research focuses on identifying these images as spam by using an artificial neural network (ANN), software programs used for recognizing patterns, based on the biological neural networks in our brains. As information propagates through a neural network, it "learns" about the data. We use a large collection of both spam and non-spam images to train an ANN, then test the effectiveness of the trained network against an unidentified set of pictures. This process involves formatting images and adding the desired training values expected by the ANN. We've trained several different ANNs using different configurations of hidden layers and nodes per layer. Test results are very promising.

Researcher: Michelle Hornback, Sara Whitson, and Chrys Wesdemiotis

Institution: University of Akron

Faculty Mentor: Dr. Chrys Wesdemiotis

A Comparison of In-Solution and In-Gel Proteolytic Digestion of Lysozyme using Matrix Assisted Laser Desorption Ionization Quadrupole-Time-of-Flight Mass Spectrometry (MALDI Q-ToF MS)

Mass spectrometry is a rapidly growing field in the proteomics community due to its speed, the ability to perform high-throughput analysis, and to fully analyze the protein of interest. Bottom-up analysis, often referred to as shotgun proteomics, involves the digestion of a protein by an enzyme, to yield a mixture of peptides. The use of peptide mass mapping helps researchers identify proteins, monitor changes in the abundance of particular peptides, and distinguish peptide modifications from one another. Performing a good peptide map requires careful selection of the enzyme to yield a fair number of peptides, but not so many as to complicate data analysis. When this mixture is injected into a mass spectrometer, the resulting experimental data can then be matched to theoretical in-silico digestions from a database such as Protein Prospector to calculate mass shifts that can be attributed to various modifications. This research showcases two types of shotgun proteomics, in-solution and in-gel digestions, and provides a comparison of the two techniques.

Researcher: Julie Hritz
Institution: University of Akron
Faculty Mentor: Dr. David Ritchey

The Diocese of Cleveland Regroups its Fleet in Troubled Water

Encountering demographic shifts of the Catholic population, financial difficulties, and a decreasing number of priests, the Roman Catholic Diocese of Cleveland faces the need to close several of its parishes in order to build a stronger future. Now the diocese must deal with an internal and external public relations crisis because of upset parishioners and inquisitive media. The objectives of the diocese are being facilitated at the parish level by multi-parish "clusters," formed to make recommendations on issues facing their parishes. Several clusters face the task of closing one or more of their parishes. In this study I plan to look at the research conducted by the diocese, the objectives of the case, the approach being taken, and the reaction of some parishioners. I will aim to determine if the diocese is conducting an effective public relations program or if improvements could have or can be made.

Researcher: Bryce Hruska
Institution: University of Akron
Faculty Mentor: Dr. Kevin kaut

Individual Differences in Juror Decision-Making: The Effect of Beliefs, Personality, Attitudes, and Knowledge in a Capital Trial

The purpose of this study was to examine the impact of juror beliefs, personality, attitudes, and knowledge on the sentence rendered in a trial. Specifically, death penalty endorsement, ambiguity tolerance, neuroticism, extraversion, openness, agreeableness, conscientiousness, and familiarity with science were examined as individual difference variables hypothesized to influence a juror's sentence in a capital trial in which biological data comprise the core of the evidence presented. In addition, the influence of these variables on juror confidence placed in the sentence and in the evidence presented by the defense was considered. Death penalty endorsement was found to influence the sentence rendered, while neuroticism impacted confidence in the sentence. Furthermore, while only approaching significance, death penalty endorsement and familiarity with science were found to possibly influence jurors' treatment of biological evidence presented by the defense.

Researcher: Yinmei Huang
Institution: University of Akron
Faculty Mentor: Dr. Cheryl Elman

Classification and Regression Tree (CART) Analysis: Methodological Review and Its Application

The purpose of this paper is twofold. Firstly, introduce CART (classification and regression tree) with a global overview from a mathematical basis to its application, both conceptually and statistically. Next, respectively practice two kinds of tree analysis: classification, and regression tree, focusing on its advantages of disclosing and explain interaction effect by comparison with conventional methods, such as OLS regression and logistic regression. Data in this investigation come from the National Family and Household Survey 1988.

Researcher: Susan Hunter
Institution: University of Akron
Faculty Mentor: Dr. Yang Lin

Applying Social Marketing and Diffusion of Innovation Theories: An Analysis of the Marketing and Communication Activities of Performing Arts

This study examines the marketing and communication activities of performing arts groups in Ohio and Pennsylvania and analyzed whether these activities could be categorized into concepts related to two communication theories: diffusion of innovation and social marketing. These two theories have traditionally been applied to health communication programs, but a review of the literature suggests their applicability to other social causes. Nine concepts were defined and examined in this study: communication channels, attribute, homophily, innovation-decision, opinion leaders, program development, audience segmentation, pre-program data gathering, and evaluation. An electronic survey instrument created by the researcher was distributed in August 2007 to the 2006 grant recipients from the Ohio Arts Council and the Pennsylvania Council on the Arts. Results from the survey found that eight of the nine theoretical concepts were used by a majority of arts organizations. Further, computed correlations found that the use of these concepts was not contingent on the size of the organization, which was defined to include the number of employees or the size of the annual operating budget. Additionally, those organizations who rated themselves as “effective organizations” demonstrated a higher use of five of the nine concept categories over those organizations who rated themselves as “ineffective.” This study was in follow-up to a pilot study conducted by the researcher in May 2007 in which the survey instrument was tested and then revised to improve reliabilities. A discussion of the findings, study limitations, and implications for future research are included in this analysis.

Researcher: Jacob Iselin
Institution: University of Akron
Faculty Mentor: Dr. Yang Yun

Surface Modification of Biodegradable PLGA sScaffolds For Wound Healing and Drug Delivery Applications

Biomaterials such as PLGA can be surface modified in order to control cellular attachment on scaffolds used in wound healing and drug delivery applications. However, post-processing surface modification of electrospun fibers can be difficult. We have developed an in situ technique to generate electrospun scaffolds that either block cellular interaction or encourage cellular adhesions. Specifically PLGA blended with collagen I, fibronectin, PEG-grafted-chitosan, and PEG-PLGA block copolymer have been investigated. Physical characterization of these fibers show that diameters range from 1.3 – 3.6 μ m. Contact angle studies show surface hydrophilicity to be similar between untreated PLGA, collagen-modified, and PEG-PLGA block copolymer-modified PLGA fibers. Fibronectin-modified and PEG-g-chitosan-modified PLGA fibers show a significant difference in wettability as compared to the others. Examination of cellular adherence executed in vitro shows that surface modification of PLGA fibers with collagen and fibronectin increases the level of cellular adherence through specific binding, also known as integrin binding at focal adhesion sites. In contrast, PEG-based polymers inhibit cellular adherence as compared to PLGA alone. PEG-based polymers at the surface of fibers inhibit integrin binding, and focal adhesion sites are unable to form. The result is significantly reduced adherence of cells to PEG-coated fibers through non-specific cell-to-substrate adhesion.

Researcher: Ashish Jagtiani, Joan Carletta, Jun Hu, and Dr. Jiang Zhe
Institution: University of Akron
Faculty Mentor: Dr. Jiang Zhe

A High Throughput Multiplexed Micro Coulter-Counter Using Amplitude Modulation

Development of next generation integrated lab-on-a-chip devices for detection and quantification of biological targets is urgent and critical for public health-monitoring and biomedical research. To go from laboratory to field applications, development of high density sensing arrays processing relatively large volumes of sample in reasonable time is important. Coulter-counters are established tools for sizing and counting cells and colloidal particles[1]. However, traditional Coulter-counters have low throughput as they “scan” particles individually, making real-time analysis difficult.

To improve throughput we have developed devices with parallel microchannels, each equipped with individual detection electronics[2,3]. While these devices have demonstrated the principle of parallel sample analysis, each channel is essentially an individual instrument. If the number of channels is large, implementing individual detection electronics for each channel is impractical; multiplexed detection becomes necessary.

We present the first instance of a multiplexed microfabricated Coulter-counter for high speed counting of microparticles using single set of detection electronics. Signal from individual microchannels for 30 μ m Polystyrene beads suspended in 0.1M NaCl are modulated at unique frequencies. The measured combined multiplexed signal representing all channels can be demodulated to recover the individual channel signals. Testing results indicate that throughput is improved without cross-talk between channels while maintaining detection accuracy.

References

1. DeBlois, R.W, Bean, C.P., 1970, Review of Scientific Instruments, 41, 909–915.
2. Jagtiani, A., Zhe, J., Hu J., Carletta, J., 2006, Measurement Science and Technology, 17, 1706-1714.
3. Zhe, J., Jagtiani, A., Dutta, P., Hu, J., Carletta, J., 2007, Journal of Micromechanics and Microengineering, 17 (2), 304-313.

Researcher: Joshua Johnston, Dr. M.J. Braun, and Dr. G.W. Young
Institution: University of Akron
Faculty Mentor: Dr. G.W. Young

A Parametric Analysis of the Effects of Porosity and an Extended Reservoir to the Performance of a Journal Bearing

This work considers a porous journal bearing with an eccentric external reservoir. The bearing system consists of a lubricating film, porous medium, and an external reservoir. The Brinkman-Extended Darcy Model is used for modeling the flow inside the porous medium. The rotating action of the journal acts to pump the fluid between the lubricating region and the reservoir. Simplifications are made to allow for a simplified coupled set of partial differential equations that are solved numerically using a block SOR method. It is shown that the porous layer and the reservoir increase the load-carrying capability of the journal bearing and eliminate the need for an external lubricant supply.

Researcher: David Johnstone and Dr. Christopher Miller

Institution: University of Akron

Faculty Mentor: Dr. Christopher Miller

PARAFAC Modeling of Fluorescence Excitation-Emission Matrices to Quantify Chlorine Reactivity with Dissolved Organic Matter

Characterization of dissolved organic matter (DOM) in drinking water is essential to establish its chlorine disinfection byproduct (DBP) formation potential. DOM is an optically active fraction which can adsorb light and fluoresce based upon its dynamics and characteristics. Implementation of fluorescence excitation-emission matrices can specifically characterize the DOM allowing for the derivation of predictive models. By using parallel factor analysis (PARAFAC) combined with the fluorescence spectra, the relative components of the DOM can be quantified and possible treatments to reduce chlorine reactivity can be assessed. A comprehensive laboratory study was conducted to evaluate the DOM of a given source water. Waters were analyzed before and after coagulation as well as upon chlorination. The results show changes in the concentration of each component following both coagulation and chlorination. These changes are then correlated to the changes in the DOM based upon its removal through coagulation and the reaction of DOM with chlorine. The appropriate coagulant and dose may then be adjusted to target the specific component/components of the DOM that react with chlorine leading to DBP formation.

Researcher: Edreia Jones

Institution: University of Akron

Faculty Mentor: Dr. Kathleen Tusaie

A Theory and Evidenced-based Approach to Mental Health Promotion and Disease Prevention

Purpose: To describe effectiveness of individual therapy based on the Transtheoretical Model of Change.

Design: Case study design using Rosenberg's Self Esteem Scale (ROSE), Parental Involvement Scale (PIS), and Behavior "change talk".

Methods: Completed five 1 hour individual therapy sessions to hear and record "Dawn's" life experiences. Score of instruments and analysis of change talk.

Findings: Reduced depression and anxiety symptoms. Moved from Contemplation to Action: identified 3 examples of partner abuse, reported improved self esteem, sense of empowerment, and ability to process feelings. Made efforts to reduce stressors by obtaining benefits from Temporary Assistance for Needy Families (TANF), housing, and applied for Social Security benefits. ROSE demonstrated a significant increase with pre-test mean of .80 and post-test mean of 1.7, $p=.000$. The PIS demonstrated significant increase with pre-test mean of 3.33 and post-test mean of 3.86, $p=.000$ (Total score of children).

Conclusions: Through therapeutic relationship, "Dawn" made significant changes which translated into her relationship with children.

Researcher: Adarsh Jose
Institution: University of Akron
Faculty Mentor: Dr. Dale Mugler

Cancer Class Discovery using the 1-D Wavelet Transform and Gaussian Mixture Modeling

Classifying a tumor sample is imperative in the diagnosis and treatment of cancer. DNA microarray technology enables classification of cancer based only on the gene expression profile of the cancer samples. One of the most important problems in clustering gene expression data is the limited availability of tumor samples. So choosing the features which will optimize the clustering becomes very important. The feature selection methods used now are heuristic approaches which cannot be generalized to all the datasets available.

A feature extraction method based on the wavelet transform has been suggested for training classifiers as an alternative to standard methods. This paper explores the application of wavelet transforms as a feature extraction tool for clustering gene expression data and thereby as a class discovery tool. The clustering is done by the Gaussian Mixture Model method. Models for different numbers, shapes, sizes and distributions of the clusters are evaluated using the Bayesian Information Criteria.

Different combinations of wavelets, noise thresholds and feature sizes are explored for achieving optimum results in clustering of Breast cancer, Leukemia and Colon cancer datasets.

Researcher: Prachi Kanabar
Institution: University of Akron
Faculty Mentor: Dr. Glen Njus

An Application of Laser Sensors For Three Dimensional Modeling of Hard Connective Tissues

In the field of biomechanics, Finite Element (FE) analysis is a proven approach for calculating stress, strain and deformations of bony structures. FE modeling consists of simulating biomechanical testing on computer models, which represents the structure of interest in terms of cross-sectional area, material properties etc.

To obtain a FE Model, the 3D coordinates of the structure in 3D space are required. A common method of obtaining the coordinates of a structure is from its CT /MRI scan image. Using commercially available softwares, 2D CT/MRI images are reconstructed to give a 3D model. However, these techniques are time consuming, expensive and prone to user errors.

The goal of this study aims is to develop a new method for 3D scanning and reconstruction of hard tissues. Here, a CCD displacement laser sensor is used for 3D scanning of a bone structure and a FE model is obtained for the same. This model is compared with one obtained from a CT/MRI scan. The laser sensor has an accuracy of +/- 0.1mm, is relatively inexpensive and once an assembly is designed, any number of specimens can be scanned. This will drastically reduce the time and cost when compared to current conventional techniques.

Researcher: Scott Kaschner
Institution: University of Akron
Faculty Mentor: Dr. J. Patrick Wilber

Results and examples regarding bifurcation with a two-dimensional kernel

Many problems in pure and applied mathematics entail studying the structure of solutions to $F(x,y)=0$, where F is a nonlinear operator between Banach spaces and y is a real parameter. A

parameter value where the structure of solutions of F changes is called a bifurcation point. The particular method of analysis for bifurcation depends on the dimension of the kernel of $D_x F(0,y)$.

The purpose of our study was to examine some consequences of a recent theorem on bifurcations with 2-dimensional kernels. This recent theorem was compared to previous methods. Also, some specific classes of equations were identified in which the theorem always holds, and an algebraic example was found that illustrates bifurcations with a 2-dimensional kernel.

Researcher: Lisa Kniska and Dr. Carolyn Sutter

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Sutter

The Importance of Performing and Documenting Vital Signs on a Physical Examination

TITLE: The Importance of Performing & Documenting Vital Signs on a Physical Examination

SUMMARY: Measuring & Recording a Patient's vital signs accurately is important as this gives an indication of the patient's physiological state. These vital signs, or patient observations traditionally consist of blood pressure, temperature, pulse rate, and respiratory rate.

POPULATION: The primary care office of three physicians from Austintown, Ohio. The population includes all patients, ages 16-99 that have a scheduled office exam.

RESEARCH PROBLEM: When the patient is triaged, the temperature, pulse, and respirations are omitted from the assessment, regardless of the presenting problem. Consequently, they are not documented in the medical record.

INTERVENTION: This clinical problem was addressed with two tools and a two-step approach. First, by re-educating the staff on how to accurately take a temperature, pulse, and respiratory rate via skills review and demonstration of the techniques (see Appendix A). Second, by hanging a poster/sign above the blood pressure monitor in patient examination rooms, reminding staff to properly document the vital signs in the medical records (see Appendix B).

EVALUATION: I conducted a chart audit to determine if the interventions of education and the poster campaign were effective tools in assisting the staff with performing and recording temperature, pulse, and respirations. Results indicated that they were.

Researcher: Maureen Kolasky

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Sutter

Clinical Preventive Health Maintenance Services

Clinical preventive health maintenance includes screening, monitoring, and counseling patients. Several of the major areas include monitoring/screening of blood pressure and cholesterol, cancer screenings, health risks for tobacco, alcohol, and obesity; sexual health screenings, osteoporosis screening, immunizations, and psychiatric screening. These services have proven to save the lives of thousands yearly. Physicians and other healthcare providers consistently state the importance of these services, however fail to discuss and order health maintenance screenings and diagnostic tests. There are a variety of reasons, some of which are forgetfulness and lack of time. The goal of this project is to describe the problem as it currently exists, examine current literature and guidelines, discuss current practice in one specific clinical arena, and propose a plan to further investigate this national concern. The Periodic Adult Health Maintenance Record is the interventional tool chosen to further investigate for its effectiveness to improve preventive health

service delivery and documentation. The form will be placed on patient charts for eight weeks with a chart reviewed at the end of this time period to determine compliance rates. The goal is to consistently increase rates of the recommendation, use, and follow up care for preventive services to 75%.

Researcher: Vinu Krishnan

Institution: University of Akron

Faculty Mentor: Dr. Stephanie Lopina

Synthesis, Characterization and in Vitro Activity of Nanoparticle “Paint-Brush” Conjugates for Cancer Nanotherapy

Statistical figures outline the five-year survival rate for all cancers diagnosed between 1996 and 2002 as 66%, which depicts a marked rise from the 51% that survived in 1975-1977 (1). However, cancer still remains the second leading cause of death in the United States, following heart disease. An American Cancer Society report estimated that in 2007, there will be over 1.4 million new cancer cases and over half a million cancer deaths in the United States (1). The National Institutes of Health had estimated the overall costs of cancer treatment in 2006 to be at \$206.3 billion even with a declining death rate in the last decade (1). Moreover, any use of traditional biomolecules as a treatment strategy would only elevate the treatment costs to higher levels. Though significant oncology drug discoveries have been made during the past 30 years, conventional chemotherapeutic agents exhibit poor specificity in reaching the tumor site and are often restricted by toxicity factors. The lack of a uniform biodistribution leads to harmful side-effects to healthy tissues and the need for administration of a larger than necessary drug dosage; with a higher repetitive rate so as to elicit a satisfactory pharmacological response.

Wide interest in cancer nanotherapy has led to the development of nanoparticle based “smart drugs” that have not only improved pharmacological and therapeutic properties of anticancer drugs, but also offer a less invasive alternative enhancing the patient’s life expectancy and quality of life as well. Dendrimers, due to their unique architecture and macromolecular characteristics are currently used extensively in research of nanoparticles for targeted and controlled drug delivery. The research objective is to design, synthesize and characterize a model nanoparticle based “Paint-Brush” like multi-hydroxyl capped poly (ethylene glycol) (PEG) conjugate using the dendron – bishomotris that may have a potential use in targeted cancer nanotherapy.

Characterization of the conjugates suggested that the synthesis was successful; resulting in the formation of novel “Paint-Brush” conjugates. The research also presents the initial evaluation for in-vitro characterization of the conjugate to determine its suitability as a drug delivery vector. The uniqueness in the model envisioned lies in the fact that the structure can be exploited in more than one way to develop novel hybrids that may have the ability to carry antibodies; enzymes or even additional PEG linkages that may enhance the system’s biocompatibility along with its purpose as a targeted drug delivery system for malignancies.

References: 1) Cancer Facts and Figures 2007, American Cancer Society, Atlanta, 2007

Researcher: Lynne Kulich
Institution: University of Akron
Faculty Mentor: Dr. Evangeline Newton

How Did the Fluency Development Lesson Impact the Literacy Development of 13 "At-Risk" First Grade Readers?

The presenter will discuss the results of a year-long study in which two primary level teachers tracked the literacy development of 13 struggling readers who received intensive fluency instruction in first grade. The presenter will describe how implementation of the Fluency Development Lesson (FDL) impacted students' reading progress in first grade and second grade. The presenter will explore the literacy development of these students as they moved into four second grade classrooms in which each teacher held different beliefs about the role of fluency instruction in reading. The study is guided by the following questions: 1) How does systematic and intensive fluency instruction with the FDL affect the reading performance of these 13 first graders? 2) What happens to the fluency and overall literacy development of these students in second grade classrooms with teachers who use different instructional practices? Implications for teacher education and professional development are discussed as the FDL is presented.

Researcher: Rishi Kumar, Todd Lewis, and A.I. Isayev
Institution: University of Akron
Faculty Mentor: Dr. Avraam Isayev

A Novel Process For Dispersion of Carbon Nanotubes in Polymers

Polymer/carbon nanotube composites are gaining tremendous attention both in academia and industry due to the exceptional mechanical, thermal and electronic properties of carbon nanotubes (CNTs) along with their light weight. The unique morphology and strong intertube interaction between carbon nanotubes make the dispersion of CNTs a big challenge and hence limit their effective use. A novel method was developed for the continuous dispersion of CNTs in a polymer matrix for manufacturing of high performance nanocomposites using an ultrasonically assisted twin screw extrusion process. The effect of ultrasound on die pressure, rheological, electrical, thermal, morphological and mechanical properties of polyetherimide filled with 0-10 wt% loading of multiwalled carbon nanotubes (MWNT) was studied. Ultrasonic treatment caused a reduction in die pressure with a permanent increase of viscosity of treated samples. Electrical percolation was found to be between 1 and 2 wt% of MWNT loading. Mechanical properties such as tensile strength and Young's modulus significantly increased with ultrasonic treatment and with MWNTs loading. The morphology and state of dispersion of CNTs was investigated by using HRSEM. The effect of various feed rates and shear rates on the state of dispersion of CNTs and on the final properties of nanocomposites was also studied.

Researcher: Sunil Kumar Bandaru and Dr. Shing-Chung Wong
Institution: University of Akron
Faculty Mentor: Dr. Shing-Chung Wong

Deformation and Durability Studies of Polymeric Materials

The primary objective of this study is to examine the durability and fatigue lives of a range of insulation polymers including polyvinylchloride (PVC) and crosslinked polyethylene (XLPE). The data will be useful for predicting the fatigue lives of wiring harness under selected temperature and strain ranges. True stress vs. true strain relationships and fatigue cycles vs. failure strains were obtained by conducting tensile and fatigue tests. The dependence of fatigue cycles on failure strain was established

Researcher: Kumar Kunal, Alexeil Sokolov, Christopher Roberston, and Sebastian Pawlus
Institution: University of Akron
Faculty Mentor: Dr. Alexei Sokolov

Understanding Fragility in Polymers

The understanding of how physical properties depend on chemical structure can enable the design and development of materials with controlled properties. Glass transition in polymers is one such important property that remains poorly understood. It is observed as a transition from the rubbery state to a glassy state upon cooling, accompanied by rapid changes in physical properties of a material in a very narrow temperature range. The systems that demonstrate a steep increase in segmental relaxation time, τ_a close to the glass transition temperature, T_g (a strongly non-Arrhenius temperature dependence) are called 'fragile'. On the other hand, the systems that show nearly Arrhenius dependence of τ_a are called 'strong'. Most polymers appear to be very fragile compared to small molecular weight liquids; the reasons for which are unclear. We have studied fragility in various polymers using dielectric spectroscopy and dynamic mechanical analysis. Our analysis reveals that while T_g is controlled primarily by backbone stiffness, fragility in polymers may be dependent on the relative stiffness of backbone and sidegroups.

Researcher: Mithun Kuruvilla
Institution: University of Akron
Faculty Mentor: Dr. T.S. Srivatsan

A STUDY AIMED AT ENHANCING OUR UNDERSTANDING OF THE QUASI-STATIC and CYCLIC FATIGUE DEFORMATION BEHAVIOR OF AN EMERGING TITANIUM ALLOY

A emerging high performance, high strength titanium alloy, designated and marketed under the traded name ATI 425, is viewed as an innovatively engineered alloy that is a viable replacement to the work horse and widely used alloy in the high performance markets the Ti-6Al-4V. This newly emerged alloy offers the inherent advantage of being receptive to mechanical deformation by cold working. Initially this alloy was developed and put forth for use as armor plate for ballistic protection. This alloy also shows promise for use in aerospace-related applications. In this technical presentation the quasi-static deformation and cyclic fatigue behavior of the alloy will be presented for both longitudinal and transverse specimens machined from sheet stock. The presentation will also highlight the macroscopic mechanisms and intrinsic microscopic mechanisms governing fracture in light of the conjoint and interactive influences of intrinsic microstructural features, stress state, nature of loading and matrix deformation characteristics.

Researcher: Byoung-Jo Lee and Sadhan Jana
Institution: University of Akron
Faculty Mentor: Dr. Sadhan Jana

Strengthening of polyolefins by bottom-up self-assembly of POSS nanoparticles

It is known that molecules of polyhedral oligomeric silsesquioxane (POSS) can self-assemble into spherical, fibrillar, or lamellar nanoparticles by bottom-up self assembly process while mixing with a host polymer. This study capitalizes on such nanoparticle formation to increase the melt strength and tensile properties of polyolefins and polyolefin fibers. We found that melt-mixing of POSS with polyolefins does not produce desired results due to poor compatibility between most POSS molecules and polyolefins. Therefore, a novel method was developed whereby mixtures of nucleating agents and POSS were mixed with polyolefins. Nucleating agents having higher compatibility with POSS aid its dispersion and provide templates for self-assembly of POSS

molecules into nanoparticles of 25-200 nm. A typical polypropylene (PP) formulation contains 0.3 wt% clarifying agent and 5-10 wt% POSS. These materials can be spun into fibers with close to 50% reduction in diameter and offer 60-70% increase in modulus and 20-30% increase in tensile strength compared to unfilled PP.

Researcher: Clifford Lee
Institution: University of Akron
Faculty Mentor: Dr. Matthew Wyszynski

The "Españoles" of Cervantes' Tragedia de Numancia

The Siege of Numantia, published after the life of its famous author, Miguel de Cervantes, recounts a portion of the historical invasion of the Iberian Peninsula by the Roman armies. This literary work in particular tells the story of Numantia, a city whose inhabitants choose mass suicide over subordination to the Roman Empire in 134 BC. Many of Cervantes' scholars draw attention to the ambiguity presented within the work. This ambiguity manifests itself best in trying to determine who the Spaniards are according to the drama. In his work, Cervantes refers to the Numantines as "Españoles," implying that the Numantines should be perceived as the Spaniards. However, given the historical circumstances, it may be shown that the invading Romans are, in fact, the Spaniards. With the Revolt of the Netherlands, a fundamental expression of Spain's imperial drive, there many parallels between Cervantes' Spain and the Roman invasion and consequent subjugation of the Iberian Peninsula. The case can be made then that the drama does not simply laud Spain's honorable past but also is a critique of Spain's brutal subjugation of the Netherlands.

Researcher: Alyson Leigh, Claire Tessier, and Chrys Wesdemiotis
Institution: University of Akron
Faculty Mentor: Dr. Chrys Wesdemiotis

Inorganic Polymer Degradation: A study of Poly(siloxane)s Fragmentation in the Gas Phase

The study of inorganic polymers is a growing field, due to the need and improved materials to compliment existing organic polymers. This research focuses on the characterization and degradation of a major class of inorganic polymers, poly(siloxane)s, utilizing mass spectrometry. This study evaluated the MS/MS fragmentation behavior of various poly(siloxane) systems. Siloxanes are a class of versatile polymers that have been developed for use as lubricants, surface treatments, coatings, and medical devices. Tandem mass spectrometry has the potential to provide insight into the degradation mechanisms of the polymers and could also be useful for the characterization of their macrostructures and architectures.

ESI and MALDI MS and MS/MS experiments were performed in tandem. All ESI-QIT-MS and MS_n experiments were performed on a Bruker Esquire-LC Ion Trap, solutions of polymer at 1mg/mL in a 9:1 mixture of THF:MeOH were analyzed. The MALDI samples were mixed using THF solutions of the polymer at 10mg/mL, matrix at 20mg/mL, and lithium or sodium trifluoroacetate cationizing reagent at 10mg/mL. The MALDI-MS experiments were performed with a Bruker Reflex III ToF and MALDI-MS/MS experiments were done with a Micromass Q-ToF mass spectrometer.

Researcher: Yuqing Liu
Institution: University of Akron
Faculty Mentor: Kevin Cavcchi

Selective Sulfonation of Poly(styrene-butadiene-styrene) Block Copolymers for Direct Methanol Fuel Cell Membranes

Direct methanol fuel cells are potential power supplies for portable electronic devices. A major problem is the high methanol permeability of the polymer electrolyte membrane, which reduces the cell efficiency greatly. In this research, a poly(styrene-butadiene-styrene) triblock thermoplastic elastomer has been modified to obtain a sulfonated polymer that can conduct protons. The polybutadiene block was modified using a series of hydroxylation, hydrogenation, and sulfonation reactions to obtain a conductive block. The hard polystyrene blocks in the microphase separated polymer acts as physical crosslinks resisting the uptake of water and methanol. This will in turn affect the methanol, water and proton transport properties of the membrane. The morphology and transport properties of films of these sulfonated block copolymers will be discussed.

Researcher: Tiffanie McCourt and Shannon Davis

Institution: University of Akron

Faculty Mentor: Dr. Marguerite DiMarco

Sexually Transmitted Diseases: One Less

Sexually transmitted diseases (STDs) are a public health problem. Many people do not know they have contracted STDs. STDs are referred to as the “asymptomatic infection”. A healthy approach towards prevention of STDs will lead to a health-promoting behavior. Nola Pender’s Health Promotion Model will be utilized to assess the knowledge of adolescents on STDs, the spread of infection, and how to prevent the spread of infection.

The project will examine the knowledge of adolescents from a high school in the Youngstown area on STDs and how they can prevent the spread of STDs. A focus on the human papilloma virus (HPV) and the vaccine Gardasil will be stressed. The knowledge of the adolescents will be assessed using a pretest that will evaluate the understanding of STDs and how to prevent the spread of STDs. The project will be presented by the use of a poster presentation with pictures and valuable information on STDs and immunizations. A posttest will be done to evaluate the knowledge gained by the presentation. The pretest/posttest method will be analyzed using paired-t- tests.

The project may lead adolescents to a better understanding of STDs and how they can help prevent the spread of the diseases.

Researcher: Michael McCullough

Institution: University of Akron

Faculty Mentor: Dr. Paul Weinstein

The Communal Importance of The Roman Collegia

This paper provides a look into the world of the Roman collegia and those individuals who comprised its membership. An attempt is made to gain an understanding of the workmen guilds of the Roman Republic and Imperial periods by exploring the history of these organizations, their importance to the people of Rome by way of their social impact, religious significance, political involvement, and most importantly their role in the burial practices of collegial members.

Comparisons and contrasts are also made between the collegia and their modern-day counterparts. The areas of interest such as fair pay, quality of work, and government involvement show that while there are similarities to modern unions, these groups were far removed from our own sensibilities. The research also studies the ideas held by some that the collegia were of a charitable nature. The evidence provided points towards the contrary, and gives us a better idea of the practices and ideologies that these people held.

Researcher: Elizabeth Mack
Institution: University of Akron
Faculty Mentor: Dr. John Peck

Using First-Order Reversal Curves (FORC's) to Better Characterize the Rock-magnetic Paleoenvironmental Record from Lake Bosumtwi, West Africa

Located in West Africa, Lake Bosumtwi occupies a 1Ma old impact crater. This hydrologically closed lake is sensitive to changes in moisture balance and the strength of the West African Monsoon. The complete 1 million year lacustrine sediment record was recovered in 291 m of sediment drill core from the crater's annular moat. Prior studies of Lake Bosumtwi sediment have shown rock-magnetic parameters of magnetic mineralogy, concentration, and grain size document climate variability on both abrupt and glacial-interglacial timescales.

This undergraduate research project studies magnetic hysteresis First Order Reversal Curves (FORC) to better characterize the sediment and the use of rock-magnetics as a paleoclimate proxy. FORC diagrams are used to interpret both the grain size and mineralogy of the magnetic components of the sediment. Using the major hysteresis loop samples appear to be pseudo-single domain (PSD) in size. However, the FORC method reveals that some samples are bimodal; consisting of both multi-domain (MD) and single domain (SD) sized particles. Thus the FORC diagram is better for analysis of magnetic grain size than the major hysteresis loop alone. In addition the FORC method reveals the presence of the iron sulphide mineral greigite.

Researcher: Anandia Mahadevan
Institution: University of Akron
Faculty Mentor: Dr. Dale Mugler

Ballistocardiogram artifact removal in EEG-fMRI signals using Hermite functions

The neural activity of the brain when recorded in an MRI scanner contains a lot of artifacts and one of the most significant ones is the Ballistocardiogram (BCG). BCG artifacts are introduced because of the slight movements of the electrodes and the scalp in a magnetic field due to the pulsatile flow of blood related to the cardiac cycle. Various studies have been implemented over the last few years for simultaneous EEG-fMRI acquisition and the problem of BCG artifact has been studied.

The elimination of the BCG artifact is very important for correct identification of clinical and physiological conditions like epileptic spikes or discharges that are generally obscured by this artifact. It is also of profound significance in feature extraction and its related use in Brain Computer Interface.

The purpose of this study is to identify and eliminate the BCG artifact without affecting the quality of the recorded EEG signal in an EEG-fMRI environment. Different methods have been incorporated for BCG artifact removal but none of them have been able to eliminate the artifact completely. The method using Hermite functions is able to model and successfully eliminate the BCG artifact in an EEG-fMRI signal without suppressing EEG components. The algorithm developed is computationally fast and in future can be used for real time analysis.

Researcher: Nishita Mahendra and Dr. Stephanie T. Lopina
Institution: University of Akron
Faculty Mentor: Dr. Stephanie Lopina

Synthesis and Characterization of L-Tyrosine based Polycarbonates

Poly (amino acids) are a natural choice for various biomaterial applications but due to different processing difficulties are restricted in application. This led to the development of 'pseudo' poly (amino acids) which have alternate amide and non-amide bonds in their polymer backbone. Several L-tyrosine based 'pseudo' poly (amino acids) like polyurethanes, polyphosphates, and polycarbonates have been synthesized extensively for biomaterial applications.

In this work we report the synthesis and characterization of L-tyrosine based polycarbonates. The starting material used for the synthesis of the polymer was desaminotyrosine tyrosyl hexyl ester (DTH), a tyrosine based diphenolic dipeptide molecule synthesized by a solid phase carbodiimide mediated condensation reaction. Polycarbonate was then synthesized by the reaction between a triphosgene molecule and the terminal hydroxyl groups present on the DTH monomer.

The synthesized polymer was characterized by FTIR, ¹H-NMR and ¹³C-NMR for its chemical structure, by GPC for its molecular weight and by DSC and TGA for its thermal transition characteristics. The polycarbonate of Mw ~15000 Da showed a glass transition temperature Tg of 56°C and degradation temperature Td of 300°C.

Thus, L-Tyrosine based polycarbonate was synthesized and characterized successfully and now I would be focusing on synthesizing L-Tyrosine based polyphosphates and blends of the two polymers.

Researcher: Carrie Majka

Institution: University of Akron

Faculty Mentor: Dr. Therese Dowd

The Effect of Animal Therapy on Comfort and Pain Scores in Hospitalized Children

Target Audience: This proposal is directed to all nurses who provide care for hospitalized children.

Background: Although animal therapy is frequently used with elderly patients and children, studies are primarily about the responses of elderly persons and few address children.

Problem: Empirical data is needed to validate the use of this therapy. The purpose of this study is to determine what effect dog visitation therapy has on hospitalized children.

Method: An assessment of pain and comfort will be completed on children before and after they receive a visit by a dog and dog handler from the Doggie Brigade program at a local pediatric hospital. Two pictorial assessment forms, the Baker-Wong Pain FACES scale and the Children's Comfort Posies scale, will be used to perform the assessments. The principal investigator will ask the child to point to the icons that best describe his pain level and comfort level. Age, gender, pain scores, and comfort scores are the only data that will be collected. Analysis will be done using descriptive and inferential statistics such as the paired t-test.

Results: Findings are expected to show increased comfort leading to perception of decreased pain after a therapeutic dog visit.

Implications for Practice: Empirical validation of animal therapy should encourage its continued use for hospitalized children.

Researcher: Rose Maley and Kendra Travis-Paxton
Institution: University of Akron
Faculty Mentor: Dr. Peg MiMarco

Goodwill Parenting Injury Prevention

Child abuse is a serious problem. Preventing further maltreatment by providing parents with education to alter risk factors is the ultimate goal of the Goodwill Parenting Program. Clients at Goodwill are required to attend parenting skills programs as stipulated by court order following child abuse/neglect. Parents with risk factors associated with child maltreatment are assessed and goals are made to receive visits with their children. An assessment was completed by social workers/parents and numerous areas of educational need were identified including accidental injuries and prevention.

The proposed intervention is to educate parents attending the parenting program on injury prevention. The initial assessment includes a survey regarding current safety measures utilized by the parents. Education would consist of a class lecture relative to national standards for injury prevention. Curriculum developed is based on data and literature regarding pediatric accidental injuries and prevention. Theoretical framework is Bandura's self-efficacy theory taking into consideration the parents's perception of their ability to complete a task/goals.

Evaluation of the intervention will use a pre/post survey method and compare data using paired t tests. Child abuse/neglect is often caused by lack of growth and development knowledge. Education could potentially reduce child abuse/neglect and enhance the parent/child relationship.

Researcher: Subash Mannanal
Institution: University of Akron
Faculty Mentor: Dr. Glen Njus

Biomechanical Evaluation of an Osteoporotic Humeral Shaft Fracture Fixation System Using the LCP Combination Approach

The bone plate and screws are common fracture fixation systems used for small shaft fractures as it has many benefits compared to other fracture fixation techniques. The new generation locking compression plate (LCP) is gaining support among surgeons because of its advantage in using as a compression plate, bridging plate and a combination of both these techniques.

The compression plating and the novel internal fixator principles of fracture fixation have several advantages and disadvantages when used in patients with osteoporosis. The aim of the study was to absorb the advantages of both the plating techniques and to incorporate them into one producing a synergy of both the procedures using a combination approach. This can give the surgeon a wide variety of options for an optimal fracture fixation depending on the mode of fracture and patient's condition. This may significantly reduce the treatment time and expenses.

Individual specimens were analyzed for construct stiffness, plate strain, and fracture site micromotion by using a non-destructive 4-Point bending in which 10,000 (1Hz) cycles of loads were applied. The results obtained were compared with the control and analyzed using standard statistical methods.

Researcher: Salma Mansour and Dr. Margaret Halter
Institution: University of Akron
Faculty Mentor: Dr. Margaret Halter

Stigma and Help-Seeking for Depression in the United Arab Emirates

This study investigates the relationship between attitudes toward depression and an individual's own endorsement for seeking help should they get dressed. While stigma negatively impacts people in the United States getting care, it may be worse in other cultures. The setting for this study was the United Arab Emirates (UAE) where depression tends to be viewed as a feeling rather than a biologically-based mental illness. The population for this study was 50 Muslim males and females from an urban public clinic.

Researcher: Rachel Manthe, Parth Shah, and Dr. Yang Yun
Institution: University of Akron
Faculty Mentor: Dr. Yang Yun

Fabrication of nanofibrous membranes via electrospinning of novel L-tyrosine based polyurethane

In recent years, non-woven fibrous matrices prepared using electrospinning have found widespread applications as scaffolds in tissue engineering and as membranes for drug and gene delivery applications. The objective of this work is fabrication and characterization of nanofibrous matrices from novel L-tyrosine based polyurethane PCL-HDI-DTH (PCL-Fx-DTH) and examine the effects of polymer concentration on various properties pertaining to biomedical applications. The morphology studies of electrospun membranes shows that at all concentrations, PCL-Fx-DTH leads to the formation of beaded fibers with a three-dimensional honey comb type structure; however, the degree of bead formation decreases as the polymer concentration increases. The average fiber diameters have been determined to be within the range of 400-900 nm for all polymer concentrations. The water uptake studies indicate that tendency of the membranes to swell increases with an increase in polymer concentration. Hydrolytic degradation studies prove that the electrospun films lose approximately 12% mass over a period of 28 days and the mass loss is found to be a function of the polymer concentration used for the electrospinning process. Thus, novel L-tyrosine based polyurethane based electrospun nanofibrous membranes have been fabricated and characterized with the aim of utilizing these for biomedical applications.

Researcher: Amanda Matousek
Institution: University of Akron
Faculty Mentor: Dr. Maria Alejandra Zanetta

Dispelling the Myth of “La mujer roja”: The Counter-history of Military Dictatorships in Spain and Argentina.

Franco's dictatorship in Spain (1939-1975) and “The Dirty War” in Argentina (1976-1983) share many characteristics. In both cases, militaries seized power and ruled by terror. The public was silenced and those who spoke out against the government were censored, tortured, disappeared and/or murdered. The objective was to eliminate an internal enemy, anyone considered to be “subversive.” Often, this enemy espoused communist ideals considered detrimental to society. One of these enemies was the female activist. Called “la mujer roja,” she is characterized by her dual-marginality as both a female and a prisoner in dictatorships where the male-female binary opposition is intensified. I observe “la mujer roja” in two novels: *La voz dormida* by Dulce Chacón (Spain 2002) and *The Little School* by Alicia Partnoy (Argentina 1998). They dispel the military

myth of “la mujer roja,” give credibility to the counter-history—history from the marginalized perspective—and resist national collective oblivion by highlighting their governments’ contradictions and denouncing the recorded history’s denial of crimes against humanity. There remains a need to compile and tell the stories of the dormant voices in these supposedly democratic countries. These novels provide a true definition of “la mujer roja” that contributes to the search for the truth.

Researcher: Rebecca Michaels and Jamie Thomas

Institution: University of Akron

Faculty Mentor: Dr. Peg DiMarco

New Adolescent Immunizations

New vaccination recommendations for adolescents have been made by the CDC. In 2005, the CDC recommended that adolescents should receive meningococcal conjugate (MCV4) vaccine, as well as tetanus, diphtheria, and acellular pertussis (Tdap) vaccine. In 2006, the CDC recommended the human papillomavirus (HPV) vaccine for girls aged 11-12 years. Hepatitis B (HepB) vaccine in Ohio was not required until the early 1990’s, so teens from 15-19 maybe missing the vaccine.

The program will educate adolescents/families in Medina schools about new immunizations available to adolescents. Educational materials about the disease/vaccine will be given using written material and question/answer session. Nola Pender’s Health Promotion Model will be the basis for guiding the program. Educating youth and providing them with information to promote a healthy lifestyle and prevent health complications may promote their health behaviors.

To assess the need, immunization records of the teens will be reviewed. Educational sessions will be scheduled and a 20 question survey of knowledge related to the vaccines will be given before and after sessions. Scores will be compared using paired t tests. Adolescents are prone to high risk behaviors and education regarding potential life threatening diseases may help to protect themselves against preventable diseases.

Researcher: Jason Miller

Institution: University of Akron

Faculty Mentor: Dr. Donald Quinn

Efficient Modeling of Mechanical Lap Joints

It has been shown the mechanical dissipation arising from mechanical joints in large built up structures is largely responsible for the damping of the overall structure. The length scale associated with dissipation at the joint level is much smaller than the length scale of the overall structure. The small length scale at the joint level makes large predictive models of built up structures impractical due to computational costs associated with the decreasing time scale arising from the Courant–Friedrichs–Lewy (CFL) condition. To minimize the effect of the CFL condition a reduced order, quasi-static Iwan type model of a typical lap joint is presented. It will be shown that the reduced order quasi-static model will capture all important joint characteristics such as dissipation and nonlinear stiffness, as well as, greatly increase computational efficiency.

Researcher: Wai Moe

Institution: University of Akron

Faculty Mentor: Dr. Jean Pan

Analytical Prediction and Mechanical Design of a High-Altitude Intelligent Balloon

Development of an intelligent balloon flying at near-space altitude for atmospheric studies, remote sensing, and image capturing is one of the most attractive experiment for balloon technology. A helium filled balloon has been designed, developed, assembled and launched by an undergraduate team at the University of Akron.

The mechanical engineering and electrical engineering teams worked together to equip the balloon with a temperature sensor, pressure sensor, data collection/storage device, a wireless data transmitter and aerial image-capturing unit.

The ultimate goal of the project is to develop a wirelessly controllable intelligent balloon model which can go up to near-space altitude of 95,000 feet and transmit the atmospheric data back to the primary station instantaneously. This research project provides a cost efficient approach for scientific observations and atmospheric research at near-space altitude.

Researcher: Brittany Muffet
Institution: University of Akron
Faculty Mentor: Dr. Jon Miller

The Columbian Magazine and Nationalism in Antebellum America

The development of magazines drastically influenced the development of American culture. The increasing popularity of magazines shifted the public view of authors as it informed the development of American literature. Additionally, magazines reframed the craft writing, transforming it secretive “hobby” to a well-respected commodity. In increasing the variety and circulation of literature, magazines encouraged political, social, and moral discourse among Americans. Public support for magazines paralleled the desires of many Americans to develop a cultural identity apart from England. The Columbian Magazine, edited by John Inman, provides a cultural as well as a literary criticism. In the introduction to the first issue of the magazine, Inman stresses the superiority of the magazine to the novel and the newspaper. Inman’s criticism of novels and newspapers indicates that American literary culture is beginning to form an identity apart from European literary culture, which the novel and newspaper characterized. This paper therefore uses The Columbian Magazine to exemplify how the promotion of American magazines encouraged the rise in American nationalism during the mid-nineteenth century.

Researcher: Nathan Mullenix
Institution: University of Akron
Faculty Mentor: Dr. Alex Povitsky

Ablation is a process of removing material from a surface by some combination of vaporization, chemical reactions, and mechanically erosive process. Understanding ablation is important in a wide range of fields from re-entry vehicles to laser machining. For ablation it is important to understand the mutual link between heat transfer, phase change, chemical reaction and gas dynamic sub-processes. Comprehensive models that capture this linking have been lacking. A mathematical model for ablation via sublimation will be explained that combines solid heat transfer, gas dynamics, and phase change processes into a unified set of equations. The Reactive-Riemann solver that has been developed to solve this system of equations will be described. The implementation of this solver for parallel computing will be discussed. Results from a simple test case will be presented.

Researcher: Srinidhi Murali, Dr. Jiang Zhe, Xingagao Xia, and Dr. Joan Carletta
Institution: University of Akron
Faculty Mentor: Dr. Jiang Zhe

A Microfluidic Capacitive Sensor For Wear Detection in High Viscous Fluids

There is an urgent need for real time monitoring of degradation and wear of machine parts. Critical in military applications such as jet engines and aircraft gear boxes which need continuous monitoring for wear to avoid catastrophic system failure. Evidence of deterioration can be determined by analysis of the lubricating fluids used in these systems.

We aim to develop a microfluidic sensor for electronic monitoring of debris in high viscous fluids. Wear particles in the fluid are detected one at a time as they flow through a microchannel. As the debris particles suspended in a non-conducting lubricating medium flow through the microchannel, they are detected as a function of the capacitance change. This change in capacitance is very small (~10-15F) and is detected using precise external electronics connected to the sensor.

Proof of concept experiments have demonstrated that the capacitance change has linear relationship with particle size. We present the design, fabrication and testing results for a polymer based microfluidic device with patterned Au/Ti electrodes. Aluminum abrasives (size varying from 20-25 microns) suspended in SAE-5W motor oil as the fluid is employed in the experiments. These devices are portable, cost effective with low sample consumption and can be used for real time application.

Researcher: Dan Musser
Institution: University of Akron
Faculty Mentor: Dr. Patrick Wilber

Thermal Transport in Interacting Chains of Carbon Atoms

To understand the thermal transport properties of carbon nanotubes and graphene sheets, we investigate the dynamics of two parallel chains of carbon atoms. The distance between the chains is fixed. To simulate a given temperature at one end of the chain, the motion at that end is prescribed. We then use the kinetic energy at the opposite end of the chains after a desired length of time to effectively measure the temperature. The atoms on one chain interact with the atoms on the parallel chain by van der Waals forces, while the atoms on the same chain interact with their nearest neighbors by C-C interatomic potentials. We use standard ODE techniques and MATLAB to conduct numerical simulations providing graphical representations of the carbon atoms and their displacements over time.

Researcher: David Nassar, Andrew Stine, Curtis Clemons, J. Patrick Wilber, Gerald Young, and Amy Milsted
Institution: University of Akron
Faculty Mentor: Dr. Gerald Young

Mathematical Model and Experimental Results of Biofilm Growth

A biofilm is a community of microorganisms embedded in a matrix of polysaccharides, proteins and nucleic acids. The medical treatment of infections resulting from biofilms is complicated because biofilm microorganisms are more resistant to antimicrobial agents than the same microorganisms in non-biofilm conditions. This presentation describes a subset of a comprehensive experimental and mathematical modeling investigation addressing the treatment of biofilms in the respiratory tract. The subset study's purpose is to experimentally validate a mathematical model

for biofilm growth. Biofilms are produced by inoculating single colonies of bacteria (*Pseudomonas aeruginosa*) into 10ml of Tryptic Soy Broth and incubating at 37° C. The biofilms are grown for 1, 3, 5, and 7 days (n=4 biofilms per time point). Biofilms are imaged in light, fluorescent, and scanning electron microscopy to quantify thickness and composition. The mathematical model consists of reaction-diffusion equations for the transport of soluble components, coupled to population equations for the particulate components (bacteria populations, EPS, and liquid). A one-dimensional approximation through the thickness of the biofilm is used to solve for the soluble and particulate components and an evolution equation for the biofilm thickness.

Researcher: Caitlin Nay and Belinda Franko

Institution: University of Akron

Faculty Mentor:

A Comparison of Carbonate Contents of Pink Inclusions to those of Surrounding Gray Glacial Sediments in Eastern Ohio

Field mappers have noted pink calcareous inclusions in the gray Illionian Titusville Till of the glaciated Allegheny Plateau for over 50 years. A clue into the origin of these inclusions may lay in an examination of the distribution of carbonate in various size fractions of pink inclusions and their surrounding gray glacial sediments. Data from carbonate analysis of the silt and clay fractions were compared with those of the sand fractions in the diamicts. Average carbonate contents of sand fractions in gray diamicts range from 7.8% to 24.3%, whereas those of pink diamicts range from 10.2% to 24.0%. Analysis of silt and clay fractions indicates that most carbonate is contained within silt fractions, having very little in clay fractions. Frequency-distribution graphs, histograms, and squiggle graphs illustrate statistical differences in the carbonate samples. Interpretations of carbonate data suggest that pink and gray diamicts have different sources. Larger variations in carbonate contents of the medium- to very fine-sand fractions of gray diamicts compared to those of pink diamicts suggest that carbonates of gray diamicts originated locally, whereas larger percentages of carbonate in fine fractions of pink diamicts suggest a more distant source.

Researcher: Brenda Ortiz-Loyola

Institution: University of Akron

Faculty Mentor:

Federico García Lorca's Bodas de sangre and Carmen de Burgos's Puñal de claveles: two versions of the same story

In 1928 in Níjar, Spain, an event occurred that shook Spanish society: a crime of passion. This incident exposed how deeply-rooted were some beliefs about honor and the traditional roles of woman and man in society. However, this same event inspired two different literary works. In general terms both literary works exposed the consequences of living in a patriarchal society. Nevertheless, *Puñal de claveles* empowers the female character and gives an alternative ending to the story. In *Puñal de claveles* the female character can escape from the retaliation of the patriarchal society. *Carmen de Burgos* used this new ending to transgress the subordinated position where woman had been confined in this patriarchal society. Conversely, Federico García Lorca developed a drama where the characters can not avoid the negative consequences of their doing. The end of his drama does not provide alternatives neither for the female character nor for the male character. This dissimilarity can be ascribed in part to the difference in gender of the authors. However an additional consideration is that as a homosexual, García Lorca was unable to foresee a better future in a society that rejected everything that was considered untraditional. In this context, I will compare the approach that each literary work takes to the event of Níjar.

Researcher: Gary Orum
Institution: University of Akron
Faculty Mentor: Dr. Gerald Young

Formation of Rimstone

This research addresses some of the fundamental unanswered questions concerning the physics and chemistry of rimstone formation. Rimstone (travertine) dams and flowstone are mineral deposits that are found on the land surface, in caves, and in other settings. These forms appear to evolve under geochemical and hydrodynamic control. Mathematical modeling of this solid-aqueous system is carried out in order to explain the system scale (cm-meter) patterns of rimstone dams in these deposits. The mathematical model consists of a system of equations to describe the combined behavior of a thin liquid film, reactive chemical species, and moving interfaces (air-liquid and liquid-mineral). The equations are solved with the limits that the film of liquid is thin compared to the downstream features of the system, the volumetric flow rate is either a constant or seasonally fluctuating, and the transport of the reactive chemical species is by convection.

Researcher: Gayatri Paknikar
Institution: University of Akron
Faculty Mentor: Dr. Narender Reddy

IMAGE BASED FACIAL EXPRESSION CLASSIFICATION SYSTEM USING COMMITTEE NEURAL NETWORKS

Human communication has two main aspects: verbal (auditory) and non-verbal (visual). Facial expressions, body movements and physiological reactions are the basic units of the non-verbal communication. Facial expressions and related changes in facial patterns give us information about the emotional state of the person and help to regulate conversations with the person and understand the overall mood of the person in a better way. It plays an important role in human interaction and non-verbal communication. Thus with the expression of facial features, multi-media man-machine communication systems could promote more efficient performance. Facial expression analysis performs important role in other fields also, like terrorism, forensics, psychology, stress level measurements for astronauts and computer vision / man machine communication systems etc.

The goal of this study is to classify different facial expression and in effect different moods of individuals from static facial images. We plan to do a comparative study using committee neural networks to find the optimum parameters to improve the accuracy of classification over the previous work.

The future scope of this study can be image reconstruction by changing the parameter values which can be used in psychological treatment or in persuasive computers.

Researcher: Kedar Pathak
Institution: University of Akron
Faculty Mentor: Dr. Alex Povitsky

Computational Modeling of Plume Dynamics in Multiple Pulse Laser Ablation

The flow field induced by nanosecond laser ablated plume in the presence of background gas is simulated numerically. The study of plume flow that occurs in laser ablation is important for it can yield information on ablation process itself and the properties of end product for which the ablation is carried out. The major challenge involved in modeling plume dynamics, is twofold: (i) the time scale of simulation spans six orders of magnitude, from nanosecond to millisecond, and (ii) the high

nonlinearity of governing equations because of high pressure, temperature and injection velocity of plume. A computational model is developed that can account for the entire time scale and high nonlinearity. This model is a combination of numerical methods and includes multi-time step and multi-size grid technique. The plume dynamics for single plume is explained with the help of proposed model based on vorticity dynamics. The model not only helps in understanding the expansion dynamics of plume but also provides quantitative comparison amongst numerical methods. The validity of nano-to-micro second range viscous and inviscid models of plume dynamics is discussed by means of evaluation of source terms in the vorticity transport equation. The role of turbulence is evaluated by millisecond-scale modeling of plume expanding in surrounding furnace gas with imposed turbulent gust. Shielding of laser beam by previously ejected plume in multiple laser hits is important because it changes energy deposition of incident laser pulse at the target surface and in turn influences the ablation dynamics and amount of material removed. To account for this shielding effect, shielding models are developed and implemented. The quantity of ablated mass due to the shielding effect is investigated.

Researcher: Rachel Petrick

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Sutter

Use of the Framingham Risk Assessment in the Primary Care Setting

The Framingham Risk Assessment was designed to accurately assess coronary artery disease and pinpoint specific health risk factors. In recent years, the incidence of coronary artery heart disease has been on the rise, becoming the single leading cause of death in the United States today. It was estimated in 2004 that over 79,400,000 Americans were affected by one or more forms of cardiovascular disease (American Heart Association, 2007). Coronary heart disease is comprised of all forms of hypertension, myocardial infarction, angina pectoris and cerebral vascular accidents. Understood risk factors for cardiovascular disease include: male gender, family history, tobacco smoking, hyperlipidemia, hypertension, physical inactivity, obesity, diabetes mellitus, stress and alcoholism. With the prevalence of these risk factors coupled with the incidence of coronary heart disease and resulting death, management of coronary heart disease in the primary care setting should be of utmost priority. It is imperative that these risks be accurately assessed and addressed in the primary care setting for all men over 35 years of age and starting for women at the time of menopause. Through this project I furthermore propose that all individuals 20 years of age or greater be screened using the Framingham Risk Assessment.

Researcher: David Poeschl

Institution: University of Akron

Faculty Mentor: Dr. Timothy O'Neil

Extending Rotation Scheduling

Most computation performed on modern computer systems is iterative in nature, and there is therefore a great research interest in algorithmically parallelizing iterative processes. Rotation scheduling is an existing technique for producing optimized static schedules for iterative processes on parallel hardware. Two additional existing algorithms, multi-dimensional retiming and probabilistic retiming, were developed by researchers to schedule iterative processes under very particular scheduling constraints. We develop adaptations of these algorithms and apply them to the original rotation scheduling technique. We discuss and analyze the resulting efficiency and effectiveness of these new algorithms.

Researcher: Elizabeth Powers
Institution: University of Akron
Faculty Mentor:

Crisis at Summit Mall

This paper examines the public relations crises that have occurred at Summit Mall, part of the Simon Mall chain. Several robberies, a carjacking and a bomb threat happened within the last two years. Store managers and employees are concerned about losing business. Mall patrons want to feel safe while shopping and these incidents cause shoppers to feel uneasy about coming to Summit Mall. Press releases inform the media of the details of the incident. In-store memos issued by the mall let store employees know what is going on and citizens get their news from the local press. Bad press makes people more reluctant to shop at Summit Mall. The researcher looked at the response of the mall to the crisis, and the public's reaction to the events. Also an evaluation was done of the mall's crisis plan prior to and after the incidents. This paper studies the impact of the incidents on Summit Mall's image and the community of Fairlawn.

Researcher: Jennifer Prebish
Institution: University of Akron
Faculty Mentor: Dr. Peg DiMarco

Nutrition in Toddlers

Limited information on nutrition of the toddler exists. Parents often have questions on what, how much, and how often to feed their child once they are no longer taking a bottle. Pediatric offices have limited handouts for parents on toddler nutrition.

The proposed intervention is to develop a handout that would assist parents with nutrition questions of their toddler. The handout will contain nutritional ideas about what parents should feed their toddler, introducing new foods, importance of routine and developing good eating habits. Data about the handout will be collected at a pediatric office. Parents (n=25) will complete a pre-test and a post test with nutritional questions. Results will be compared using paired t tests. Input on the effectiveness of the handout will be evaluated, and changes will be made accordingly.

Bandura's self-efficacy theory, which involves the combined effects of parent's knowledge about a task and the confidence in their ability to perform that task successfully, that influences behavior. The parental confidence has been identified as a significant factor in parent-toddler interaction and has been shown to be related to the specific proficiency during feeding. Good eating habits are nurtured by parents and necessary for life-long healthy eating.

Researcher: Rama Krishna Pullaguntia
Institution: University of Akron
Faculty Mentor: Dr. Timothy O'Neil

Rotation Scheduling on Synchronous Data Flow Graphs

The speed with which an operation can be performed depends on the amount of parallelism that can be exploited in the operation.

Our focus of research is mainly on the Iterative process, which are a sequence of operations that are repeated over and over. These processes are represented using graphs called Data Flow Graphs (DFG), where each operation is represented by a vertex and the dependence among them is

represented by an edge. The amount of time taken by a process to complete is called the length of the Schedule.

Our objective of research is to study the application of a technique called “Rotation Scheduling” which is used to reduce the time taken by an Iterative process by making use of the parallel hardware.

We apply Rotation scheduling technique to Synchronous Data Flow Graphs (SDFG). SDFG graphs are different from the DFG's where each operation can produce more than one result and similarly an operation may consume more than one input to proceed to execution. We develop a few heuristics to apply rotation scheduling to SDFG and compute the optimum length of schedule.

Researcher: Zhenpeng Qin

Institution: University of Akron

Faculty Mentor: Dr. Guo-Xiang Wang

Theoretical Study of Two-phase Annular Flow Characteristics in Micro-channels

In recent years, two-phase flow and heat transfer in mini- and micro-channels play more and more important roles in many industrial applications as the advanced technology pushes the electronic devices to smaller and smaller dimensions. Many new flow patterns, which do not exist in the two-phase flow of large-size channels, have been observed in micro-channels. Stability theories of liquid-vapor interfaces have been employed to understand the appearance of these new flow patterns. This work has successfully developed a theoretical model to predict the configuration of annular static liquid film under the influences of gravitational and surface tension forces. The model is then used to evaluate the influence of the gravitational force on the film thickness variation within a circular tube with different tube diameters. An interfacial instability model was also extended to study the stability of a two-phase annular flow in a mini- or micro-channel. A correlation between the most dangerous wave-length of perturbation and the gas core diameters was obtained. Further work on dynamic liquid film, combined with instability, has been pointed out.

Researcher: Sajal Raikar

Institution: University of Akron

Faculty Mentor: Dr. Glen Njus

Evaluation of Tensile strength of Cement augmented bone screws after fatigue testing in Osteoporotic bones

Bone cements are widely used in joint arthroplasty and vertebroplasty of the spine. Due to their good strength, biocompatibility and bonding capability bone cements are considered as potential biomaterials for anchor augmentation in osteopenic and osteoporotic bones. Although previous studies have shown encouraging results regarding pullout strength of cement augmented screws in osteoporotic bones, their long term behavior under repetitive loading condition has not been deeply investigated. The objective of this study was to compare the fatigue resistance of non augmented screws and screws with cement augmentation in both normal and osteoporotic bones.

Cortical screws were divided into four groups with 1st set of screws inserted directly into normal bones, 2nd set of screws inserted into normal bones with cement augmentation, 3rd set of screws inserted into osteoporotic bones and 4th set of screws inserted into osteoporotic bones with cement augmentation. Fatigue consisted of non-destructive cantilever cyclic loading at 2 Hz for 30,000 cycles. Subsequent to this pullout strengths of all screws in each group were evaluated using quasistatic axial load ramps.

Researcher: Arun Puindi Ramu and Zhenpeng Qin

Institution: University of Akron

Faculty Mentor: Dr. Guo-Xiang Wang

3D- Pulsating blood flow modeling of Brain and Aortic Aneurysms.

Aneurysm is one of the three primary killer diseases in the United States today. According to ASITN (the American Society of Interventional & Therapeutic Neuroradiology), one in every 15 people in the United States, will develop a case of brain Aneurysm. The pulsating nature of blood flow, resulting in Hemodynamic forces is the primary cause, for the growth of Aneurysm. Computational Fluid Dynamic modeling, using FLUENT, is used to overcome the difficulty involved in conducting in vivo measurements. In this work we have carried out three dimensional modeling, incorporating pulsating blood flow, applied to various dimensional models of aneurysms, namely, the Brain and Aortic Aneurysms. The blood flow with and without the pulsating flow model, are compared to show the effect of hemodynamic forces acting on the aneurysm. The pressure distribution curves obtained, using this model will assist in better understanding the growth and the cause behind the rupture of aneurysms.

Researcher: Jason Randall

Institution: University of Akron

Faculty Mentor: Dr. Sadhan Jana

Polymer Crosslinked Silica Aerogel Composites For Thermal Insulation

Silica aerogels qualify for thermal insulation in applications where size and weight are at a premium due to inherent low thermal conductivity and low density. For example, silica aerogels have typical porosity up to 95% and thermal conductivity of 0.02 W/mK. However, they are fragile due to their highly porous structure and absence of strong forces holding the secondary particles in the network. Researchers observed that native silica aerogels can be crushed by stresses as low as 31 kPa, thus ruling out many potential applications. The weak inherent strength and the method of aerogel formation pose an additional constraint - the aerogel articles must be cast in their final shape. The focus of the present work, in collaboration with NASA Glenn Research Center, is to use specific reactive polymer chains to crosslink aerogel networks and to dramatically increase the strength over their native counterparts, while retaining their low density and thermal conductivity. This research is anticipated to widen the range of new applications, such as deployable insulation systems, or greatly improve the ease of installation of aerogel insulation systems into existing products.

Researcher: Anna Roller

Institution: University of Akron

Faculty Mentor:

Panic Strikes Highland Square

With the closings of neighbor restaurants, Two Amigos and Dodies the gem of Akron is in an uproar. Highland Square is often referred to a quaint little bohemian spot. Things are not so quaint these days. Jobs have been lost, businesses are experiencing profit loss and customers are going elsewhere to eat, making this a PR crisis.

Pieces of West Akron's heart belong to Highland Square. In the summer couples hold hands and window gaze at the eclectic shops, while eating ice cream. Everything one person could need for a night out can be found in one strip.

Today the streets are silent. This has left many surrounding businesses to ponder their fate. "We no longer have the professional foot traffic that we had when the restaurants were open. It is all young people going to Chipotle. I fear that if we don't move, we will not be in business," said Patty of Summit Taylor Company.

When these restaurants left, they took with them jobs and profit and left a crisis. Unless new businesses fill the void, old businesses will have to leave. Nothing will be left of Highland Square but a rundown strip of memories.

Researcher: John Reho

Institution: University of Akron

Faculty Mentor: Dr. Rolando Ramirez

The Effects of Testosterone on Mesenteric Artery Constriction in WKY and SHRy Males

Testosterone is a sex hormone that has been demonstrated to affect cardiovascular behavior. The Y chromosome has been shown to cause increases in testosterone levels and systemic blood pressure. The objective of this study is to determine what effect testosterone exposure would have on resistance-caliber mesenteric arteries in vitro. We used small, second-order mesenteric arteries (~300 μm diameter) from WKY and SHRy males 12-15 weeks of age on a pressurized arteriograph system. Vessels were exposed to 0.1 μM testosterone for 2 hours and then constricted with phenylephrine in a cumulative response curve. Control arteries were not exposed to testosterone. SHRy and WKY animals responded similarly to phenylephrine concentrations. Testosterone, however, increased phenylephrine induced constriction of small arteries in WKY males with no change in response in SHRy animals. In conclusion, testosterone seems to have an effect on constrictor responses in small, resistance arteries that may have an effect on blood pressure.

Researcher: Steven Reutter

Institution: University of Akron

Faculty Mentor: Dr. Adil Wadia

Selected Geological Resources for the State of Ohio and Their Applications

The study discusses selected natural resources and their applications that are found in Ohio. These benefits of these materials are not limited solely to Ohio. Limestone has many uses, ranging from toothpaste and antacids to vinyl flooring and fillers in construction activities. Sand and gravel deposits are mined from the entire state and used primarily for fill materials. Also they are the most recently mined due to their low per unit value. Sandstone produced in Ohio is generally highly attractive for construction and is mined in the eastern half. Clay and shale products are used in tile making as well as covers and linings for landfills as well as their contribution to agricultural activities. Ohio's gypsum deposit is used entirely in wallboard production. Salt is almost entirely used in deicing operations. Mining techniques vary from other minerals commonly mined due to salt's natural properties. Peat usage is limited to cleaning up oil spills, filtration, as well as potting plants and coal is used primarily for electrical energy. Natural gas and oil are highly versatile and serve many purposes. The paper will discuss the importance of the abovementioned materials and provide quantitative information in terms of their importance and contributions.

Researcher: Shawn Ryan
Institution: University of Akron
Faculty Mentor: Dr. Dr. J. Patrick Wilber

A Buckling Problem for Graphene Sheets

We develop a continuum model that describes the elastic bending of a graphene sheet interacting with a rigid substrate by van der Waals forces. Using this model, we study a buckling problem for a graphene sheet perpendicular to a substrate. After identifying a trivial branch, we combine analysis and computation to determine the stability and bifurcations of solutions along this branch. Also presented are the results of atomistic simulations. The simulations agree qualitatively with the predictions of our continuum model but also suggest the importance, for some problems, of developing a continuum description of the van der Waals interaction that incorporates information on atomic positions.

Researcher: Vincenzo Scionti, Alyson Leigh, Sara Whitson, and Dr. Chrys Wesdemiotis
Institution: University of Akron
Faculty Mentor: Dr. Chrys Wesdemiotis

Characterization of Peptides resulting from Trypsin Digestion by Mass Spectrometry

Enzymatic digestion is a useful strategy for researchers studying post-translational modifications, such as: glycosylation, phosphorylation, acetylation and methylation. These modifications can cause a host of reactions downstream in the cell some of which include gene over- or under- expression which can lead to cancer growth. As a result it is of increasing interest to chemists and biologists to understand what these modifications are, how they occur, and their strength. One common enzyme, trypsin, yields peptides that are carboxylly terminated with either arginine or lysine.

Preliminary work in this study focuses on analyzing the peptides resulting from a Trypsin digestion using a Bruker-Esquire-LC Quadrupole Ion Trap (QIT) mass spectrometer. Peptides were dissolved at 1 mg/mL in an acetonitrile:water mixture and spiked with acetic acid to facilitate protonation for MS analysis; all solvents were HPLC grade. These peptides were carefully selected for initial studies due to the limited availability of the post-translationally modified glycosylated peptides. Determining the site of glycosylation on modified peptides will be the focus of future studies.

Researcher: Mustafa Sen
Institution: University of Akron
Faculty Mentor: Dr. Judit Puskas

Green Polymer Chemistry: Telechelic Poly(Ethylene Glycol)s via Enzymatic Catalysis

The modification of natural or synthetic polymers using enzymes as catalysts is an environmentally friendly alternative to classical chemical modification reactions, which often require harsh reaction conditions. Despite the potential advantages, i.e. milder reaction conditions and highly specific transformations, only a few examples have been reported in the literature involving either natural or synthetic polymers. In addition, most of these examples were characterized by low conversion. In this paper we present the quantitative functionalization of commercially available poly(ethylene glycol)s (PEG) with both narrow and broad molecular weight distributions by transesterification using vinyl esters as the acyl donors and *Candida antarctica* lipase B (Novozyme 435) as the enzyme catalyst. ¹H NMR and ¹³C NMR together with MALDI-TOF mass spectroscopy verified the expected structures.

Researcher: Sunny Sethi

Institution: University of Akron
Faculty Mentor: Dr. Ali Dhinojwala

Gecko inspired self-cleaning adhesives

Self cleaning and high adhesion are two contradictory properties. Former refers to remaining clean by being non sticky whereas latter is defined as ability to stick. As such, both these properties are seen simultaneously in a few natural systems like gecko feet. Gecko feet have hierarchical hairy structure, which allows them to stick to different surfaces without use of any viscoelastic material. Not only high adhesion, these hairs make gecko feet self cleaning, thus allowing them to walk continuously without worrying about losing adhesive strength. Such properties if mimicked synthetically could form basis of a new class of materials, which, unlike conventional adhesives would show two contradictory properties, self cleaning and high adhesion. These materials would form essential component of applications like wall climbing robot. We tried to synthesize such material using micropatterned vertically aligned carbon nanotubes. Micro-patterning the structure helped in inhibiting crack propagation, thus gave much higher adhesive strength than a uniform film. Optimized pattern size and aspect ratio made these films superhydrophobic. This tape showed self cleaning behavior as seen in lotus plant, in addition to high adhesion, thus allowing it to be reused, even after it gets soiled.

Researcher: Manisha Shah
Institution: University of Akron
Faculty Mentor: Dr. S.T. Lopina

Formation and Characterization of Porous polyurethane scaffold for application in field of tissue engineering

Biodegradable scaffolds have played an important role in field of tissue engineering for past few decades. A micro porous biodegradable polyurethane scaffold for tissue regeneration is developed. The biodegradable polyurethane has been made using amino-acid based chain extender. Solvent casting and particulate leaching was used as the fabrication technique to fashion the novel polyurethane into porous scaffolds. Scanning electron microscopy, porosity tests, and mechanical tests were performed. Various important issues related to scaffold architecture, such as scaffold's porosity, pore shape, pore size are examined. The effect of used porogen's shape, size and weight fraction on the pore shape, pore size and porosity of the scaffold was observed. The research suggests that solvent cast and particulate leached porous polyurethane scaffold is a potential candidate for tissue engineering.

Researcher: Parth Shah, Dr. Stephanie T. Polina, Dr. Yang H. Yun, and Dr. Anirban Sengupta
Institution: University of Akron
Faculty Mentor: Dr. Stephanie Lopina

Blends of L-tyrosine based Polyurethanes and Polyphosphate for Biomedical Applications

Novel polyurethanes and polyphosphate polymers with tunable material properties have been developed using a non-essential amino acid L-tyrosine. These polymers have different functional groups within their backbone thereby leading to different chemical structures and thus highly diverse physico-chemical properties, degradation rates and thus highly contrasting potential applications. However, a better application base for these materials may be developed by blending of these polymers to obtain a cohesive miscible blend thus resulting in a step wise transition in the material properties while retaining the desirable properties of both parent polymers. The blends have been fabricated using a solution casting-solvent evaporation technique and the thermal, mechanical, morphological and degradation properties of these blends have been investigated.

Thermal studies coupled with optical microscopy studies show the occurrence of phase segregation within the blends. It has been observed that an increase in polyphosphate concentration within the blends leads to increasing bulk and surface hydrophilicity as well as faster degradation times. The results obtained from these characterization studies indicate that by using composition of the parent polyurethanes and amount of polyphosphate present within the blend as changeable parameters, the material properties of the final material can be easily tuned to suit the application under consideration.

Researcher: Parth Shah, Dr. Stephanie T. Lopina, and Dr. Yang H. Yun

Institution: University of Akron

Faculty Mentor: Dr. Stephanie Lopina

Biocompatibility evaluation of novel L-tyrosine based polymers: In vitro studies

Pseudo" poly (amino acids) such as L-tyrosine based polyphosphate (LTP) and polyurethanes (LTU) have been fabricated via structural modification of poly (amino acids) by introducing alternate and repeating non-peptide bonds within the polymeric backbone. The chemical modification from poly (amino acids) to "pseudo" poly (amino acids) is expected to retain the superior initial biological characteristics while incorporating excellent physico-chemical properties into the resulting polymers.

The aim of this work is to examine the biocompatibility of novel L-tyrosine based polymers and their degradation products. The cytotoxicity of human fibroblasts exposed to LTP microparticles, LTU films, and degradation products of these materials has been examined using a LIVE/DEAD® cell assay and the results clearly demonstrate the non-cytotoxic nature of L-tyrosine based polymers and their degradation products. Cell adhesion and proliferation studies performed using L-tyrosine based polymeric substrates show that surface wettability and thus surface chemistry has an important role in determining the extent of cell adhesion on synthetic polymeric substrates. Cell quantification studies prove the proliferative nature of cells whereas immunocytochemistry studies show that the cells are well attached on all surfaces. Thus, the physico-chemical and biological characterization of L-tyrosine based polymers shows that they have excellent potential for biomedical applications.

Researcher: Stephanie Short

Institution: University of Akron

Faculty Mentor: Dr. Jean Pan

Effects of Nutrient Type on AM Fungal Communities in An Old-Field Grassland

Arbuscular mycorrhizal fungi form intricate symbiotic relationships with the roots of many different plant species. The mycorrhizae transport resources such as nitrogen and phosphorus as well as water while the plant provides carbohydrates to the fungi. Both plants and soil organisms play a central role in the nutrient cycling of communities. Examination of the effects of different nutrient inputs on am fungi is my main goal of this study. I hypothesized that different nutrient forms affect both the abundance and diversity of am fungi associated with plant communities. The study was conducted using 24 circular plots of the oldfield-grassland located at the Bath Nature Preserve in Summit County, Ohio. Treatment combinations of organic and inorganic nutrients were applied to the study plots. Soil samples were collected and analyzed by extracting the am fungal spores. Through microscopy, the spores were counted and morphological characteristics were used to help identify them. Preliminary analysis suggests that there is an increase in spore abundance and diversity among organic nutrient treatment plots. Understanding how nutrient form affects the am fungal communities related to their plant hosts can allow for a better understanding of nutrient cycling in communities.

Researcher: Anthony Shumway
Institution: University of Akron
Faculty Mentor: Dr. Kathy Tusaie

A Theory & Evidence Based Approach To Mental Promotion/Disease Prevention:Santina's Story

Background: Change theory has demonstrated efficacy in the areas of smoking cessation and diet modification but there is a scarcity of research demonstrating the application of change theory to grief.

Purpose: This case-centered poster will describe effectiveness of evidence-based, individual mental health promotion during the grief process.

Theory: The Transtheoretical Model of Change (Prochaska, 2002) involves systematic relationships among five stages of change and asserts that change is possible along a continuum regardless of one's current disposition. Motivational interviewing techniques (Miller, 2002) will operationalize the theory.

Methods: Santina is a 44 year-old Hispanic woman who suddenly lost her brother to an untimely death. Santina is mourning this loss and harbors feelings of guilt for not being more involved in his life. She has moved back to Akron to pay her respects and make sense of what has happened. Santina was provided individual psychotherapy to prevent dysfunctional grief. Progress was measured with the Texas Revised Inventory of Grief (TRIG, Faschingbauer et al., 1987) which compares emotional state immediately following loss with present state of emotion.

Outcome: Santina moved from contemplation to action. Student learned the importance of encouraging her active involvement along change continuum.

Findings and conclusions: Individual psychotherapy that is TMC and evidence based can facilitate the grief process. This client was able to process her grief while developing a cohesive narrative about her brother's life.

Researcher: Sara Sipahioglu
Institution: University of Akron
Faculty Mentor: Dr. Lisa Park

Discerning the record: Event deposition and biologic response Storrs Lake, San Salvador Island

Hurricane intensity has been predicted to rise in coming years, making it increasingly important to understand the short and long term effects of storms on tropical ecosystems. One of the best places to find these records is in the lakes on islands like San Salvador Island, Bahamas (SSI). Storrs Lake is a shallow (<2m), hypersaline (>66µs) windward lake, separated from the ocean by Holocene dunes and has had many historical washover events. My study examines the depositional history of this lake through the last 4,000 years, specifically documenting storm washover deposits and the ecological response to those perturbations. To do this, I recovered nineteen cores from throughout the lake, varying in length from 5 to 200 cm. These cores were analyzed for organic content, dry bulk density, grain size, chemical composition, sediment fabric, pollen, Mg/Ca and Sr/Ca trace elements, oxygen and carbon isotopes, and faunal composition. Preliminary results indicate an episodic record of storm and background sedimentation and that the storms are easily identified by the multi-proxies used. Species richness and abundance increases after each storm event, and the

lake is slow to return to its original conditions due to freshening of the water and disturbance in the sediments.

Researcher: Ryan Slone

Institution: University of Akron

Faculty Mentor: Dr. David Ritchey

Corporal Employment: Being Assaulted for your Passion

In the 2006-2007 school year, there were 402 assaults/threats against teachers in the greater Cleveland school district.

These assaults and threats are a major public relations crisis. First, teachers are leaving the school district. Second, new teachers do not want to work in that school district. Third, Cleveland-based businesses have trouble attracting executives and workers who will not want to send their children to the Cleveland schools.

According to Joanne Demarco, president of the Cleveland Teachers Union, the actual number of assaults is higher than what is reported. Some districts discourage reports because it makes schools look bad.

James Cappetto, a South High teacher, recently left with broken bones in his neck and a fractured skull from an assault by students, said, "Over the last two years, it seems we've lost all sensibility, there are no rules in how they act in public."

In this research, I plan to examine the assaults and threats that have been reported in the papers over the last two years, while also interviewing teachers from different schools in the Cleveland District. It will be the goal of this research to come up with a general pre-crisis plan and post-crisis plan for the schools.

Researcher: Danijela Smiljanic, Sara Whitson, Alyson Leigh, and Dr. Chrys Wesdemiotis

Institution: University of Akron

Faculty Mentor: Dr. Chrys Wesdemiotis

Investigating Biomolecule-Biomolecule Noncovalent Interactions using Mass Spectrometry

Biomolecule-biomolecule interactions occurring in the body have been well documented for a long time. Such interactions include: protein-protein, protein-DNA, and others. When a protein, such as a histone, is involved in a protein-DNA interaction and experiences post-translational modification, it can decrease the electrostatic interaction between the protein and DNA leading to gene over- or under-expression which can result in cancer growth. As a result it is of increasing interest to chemists and biologists to understand what these modifications are, how they occur, and their strength.

This study focuses on analyzing the noncovalent biomolecule-biomolecule interaction between two commercially available small peptides using a Bruker-Esquire-LC Quadrupole Ion Trap (QIT) mass spectrometer. Peptides were dissolved at 1 mg/mL in a methanol:water mixture and spiked with acetic acid to initiate the formation of hydrogen bound homodimers; all solvents were HPLC grade. Next, they were mixed in various mole:mole ratios to determine factors influencing interaction. These interactions were analyzed in-situ as a stepping stone to future work including the interaction between more complex biomolecule mixtures.

Researcher: Nilufer Solak and Chrys Wesdemiotis

Institution: University of Akron

Faculty Mentor: Dr. Chrys Wesdemiotis

Structural Analysis of PEG by ESI-QIT and MALDI-QToF

Mass spectrometry is a powerful technique for the characterization of the molecular weight and composition of polyethylene glycols, which have wide applications in surfactants, drug delivery systems, and tissue engineering. The functional groups attached to PEG chain ends influence significantly the resulting chemical and physical properties. Tandem mass spectrometry (MS/MS) is often needed for specific application used to identify these groups. Definitive end group assignments from the fragments present in MS/MS spectra require, however, knowledge of the corresponding fragmentation pathways. This study addresses this need with the examination of the MS/MS characteristics of variously functionalized PEGs. MS/MS experiments on PEG 1000, 600, 200, PEG monomethyl, and dimethyl ethers as well as diacetate (DA) and dimethacrylate (DMA) were carried out using electrospray ionization quadrupole ion trap mass spectrometry (ESI-QIT MS) (Bruker Esquire-LC) and matrix assistant laser desorption ionization quadrupole time of flight mass spectrometry (MALDI-QToF) (Water Micromass Q-ToF Ultima). Lithium trifluoroacetate was used as for cationization since it gives better peak intensity than other cation salts. For the MALDI-QToF analysis, dithranol was used as the matrix. THF solutions of polymer, matrix, and cationizing salt (10 mg/ml) were mixed in the ratio of 2:10:1, respectively.

Researcher: Frances Snell

Institution: University of Akron

Faculty Mentor: Dr. Kathleen Tusaie

A Theory and Evidenced-based Approach to Mental health Promotion/Disease Prevention: Tom's Story

PURPOSE: To describe the effectiveness of evidenced-based mental health prevention using the Transtheoretical Model of Change.

DESIGN: Case study using analysis of change talk pre and post and score on the Decision Balance Measure within the context of 7 individual sessions.

FINDINGS: Movement from the Pre-contemplation stage of changed to beginning Contemplation. Completed 7 individual sessions. Pro Score of using cannabis 7 points higher than the Con score reflecting the client's desire to continue use.

CONCLUSION: The client has a greater awareness of the Pros and the Cons of cannabis use but is experiencing much difficulty in shifting this aspect of his identity as a rebel. Changing this behavior is a long term process.

Researcher: Joseph Stavole

Institution: University of Akron

Faculty Mentor: Dr. David Ritchey

Akron Metro Regional Transit Authority Needs Levy to Pass

The regional transit authority is a service that people can use to go places and it includes buses and trains. The public relations crisis is that people who ride the Metro Regional Transit Authority in Akron all of the time are not going to be able ride the buses and trains anymore if levy fails because prices would be go up. Metro Regional Transit Authority will than have to close down lines and combine many other routes. This could also mean that many of the services could be cancelled such as SCAT and many other services.

The first thing that I will research is would it be not cheaper to use a less expensive gas than ultra low sulfur "clean diesel" fuel. The next thing is would it be cheaper to combine some routes so there are not may trains and buses out at one time.

I will interview Molly Becker director of communications and marketing in the Akron Metro Regional Transit Authority. I will ask her if she has any other alternatives other to do if the levy does not pass to raise money. I would also see if there is a way that they can budget the money shortfall that they seem to have.

Researcher: Sherry Stewart

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Sutter

Vitamin D Deficiency, Function, and Falls in the Elderly: Screening and Supplementation

More and more interventional studies with vitamin D are being conducted in elderly people, the available evidence indicates that vitamin D screening and supplementation, in fallers with vitamin D insufficiency, has a significant beneficial effect on functional performance, reaction time, and balance, but not muscle strength. This would suggest that vitamin D supplementation improves neuromuscular or neuroprotective function, which may in part explain the mechanism whereby vitamin D reduces falls and fractures. Focusing on the relationship between vitamin D deficiency, function, and falls in the elderly; this retrospective study assisted further in the efforts to promote screening and treatment in the elderly known to be at risk for functional decline and falls. All patients in this sample (n=171) experienced a fall with injury at home that brought them to the hospital. Vitamin D screening and supplementation was not consistent, in fact, screening and supplementation was 6% or less in this sample. This study strengthened the validity to promote further research and education not only for our patients but as healthcare providers to follow the recommended practice guidelines for screening and treatment of Vitamin D deficiency in this population known to be at risk for functional decline and falls. Phase 2, a tool on the electronic medical record (EMR), to assist in Health Care Provider compliance with national recommendations, has been implemented as a project with the permission of the Summit County Geriatricians on February 1, 2008. Evaluation of this tool will take place March 3, 2008.

Researcher: Bethany Subel and Dr. Chrys Wesdemiotis

Institution: University of Akron

Faculty Mentor: Dr. Chrys Wesdemiotis

Analysis of Poly(styrene-co-allyl alcohol) using Mass Spectrometry

Mass spectrometry has been used to study polymers and copolymers in order to characterize end groups and find degradation pathways. In this study, mass spectrometry and tandem MS are utilized to determine the comonomer and sequence composition of a co-polymer of styrene and allyl alcohol. Such a copolymer is desired in the coatings and inks industry because of its improved hardness, gloss, color acceptance, corrosion and stain resistance, and its adherence to many different surfaces including wood, metal, plastic and paper. The mass spectrum shows that the polymer is indeed a true copolymer, consisting of more than one monomer. The complexity of the spectrum results from the fact that the mass of styrene is 104 Da and the mass of allyl alcohol is 58 Da, resulting in peaks every 10 or 12 mass units, depending on the copolymer composition. Determining the percentage of each monomer was simplified by the knowledge of the end groups so that statistical analysis of the percent styrene for each oligomer could be made. The styrene content for the copolymer ranged from 60-95%. The rest of the oligomer composition was allyl alcohol and consistent end groups.

Researcher: Lalit Subramanian
Institution: University of Akron
Faculty Mentor: Dr. Dale Mugler

A Novel Technique to Obtain the Cross Correlation of Two Digital Signals Based on Digital Hermite Functions

A new and simple method for obtaining the cross correlation of any two digital signals is developed. The cross correlation operation here is referred to strictly in a signal processing sense wherein the amplitude of each sample in the result of cross correlation of two signals is a measure of how much the two signals resemble each other at that location. This kind of information is very useful in many digital signal processing applications where it is important to find a signal that has been buried in noise – such as the return of a transmitted radar signal. A simple, closed form expression for cross correlation is derived based on digital Hermite functions, which were discovered previously by two UA professors (S. Clary and D. Mugler). The paper also includes a discussion on how it may be employed in biomedical applications. Applications of cross correlation in biomedical engineering include looking for a relation between traumatic brain injury (intracranial pressure) and heart rate.

Researcher: Jamie Thomas and Rebecca Michaels
Institution: University of Akron
Faculty Mentor: Peg DiMarco

Menactra

New vaccination recommendations for adolescents have been made by the CDC. In 2005, the CDC recommended that adolescents should receive meningococcal conjugate (MCV4) vaccine, as well as tetanus, diphtheria, and acellular pertussis (Tdap) vaccine. In 2006, the CDC recommended the human papillomavirus (HPV) vaccine for girls aged 11-12 years. Hepatitis B (HepB) vaccine in Ohio was not required until the early 1990's, so teens from 15-19 maybe missing the vaccine.

The program will educate adolescents/families in Medina schools about new immunizations available to adolescents. Educational materials about the disease/vaccine will be given using written material and question/answer session. Nola Pender's Health Promotion Model will be the basis for guiding the program. Educating youth and providing them with information to promote a healthy lifestyle and prevent health complications may promote their health behaviors.

To assess the need, immunization records of the teens will be reviewed. Educational sessions will be scheduled and a 20 question survey of knowledge related to the vaccines will be given before and after sessions. Scores will be compared using paired t tests. Adolescents are prone to high risk behaviors and education regarding potential life threatening diseases may help to protect themselves against preventable diseases.

Researcher: Angela Triplett and Dr. D. Dane Quinn
Institution: University of Akron
Faculty Mentor: Dr. D. Dane Quinn

Weakly Non-Linear Energy Harvesting with Non-Linear Coupling

Advances in electronic and consumer technology are increasing the need for smaller, more efficient energy sources. Thus vibration-based energy harvesting, the scavenging of energy from existing ambient vibration sources and its conversion to useful electrical power, is becoming an increasingly

attractive alternative to traditional power sources such as batteries. Energy harvesting devices have been developed based on a number of electro-mechanical coupling mechanisms and their design must be optimized to produce the maximum output for given environmental conditions. While the role of nonlinearities in the components has been shown to be significant in terms of the overall device efficiency, few studies have systematically investigated their influence on the system performance. Crawley and Anderson (1990) provided experimental evidence that a linear model for the piezoelectric coupling coefficient was not valid when large strains were applied. This was again seen in the work of du Toit (2005), who modeled and designed a MEMS piezoelectric vibration energy harvester. He noticed that his model, based on linear constitutive relations for the piezoelectric material, consistently under-predicted the experimental voltage produced from his device. Our research concentrates on the effects of nonlinear piezoelectric coupling models on the power output of an electromechanical energy harvester. An analytical study of a one-dimensional mechanical attachment was conducted using a multiple-scales perturbation analysis, including the effects of nonlinearities in both the stiffness and the electro-mechanical coupling. The response was then compared against numerical simulations for the system performance, focusing on the relationship between the power generated by the device, the ambient vibration characteristics, and the nonlinearities in the system.

Researcher: Adam Truelsch

Institution: University of Akron

Faculty Mentor: Dr. Heather Pollock

Odysseus the Sapphic Hero

In the Odyssey, the character of Odysseus seems at times either overly harsh or extremely benevolent. To account for his actions and better understand his motivations this paper looks to the classical poet Sappho, and her famous aristocratic ideal “a man must be a delight to his friends and a bane to his enemies.” By closely examining some key relationships in the Odyssey where Odysseus is alternately a delight to friends and bane to enemies, Sappho’s ideal is not only relevant but pervasive. Odysseus’s true friends praise him and offer their devotion while his enemies are rightfully terrified of facing him. By viewing Odysseus as driven by this aristocratic ideal it is possible to gain a greater understanding of his character as well as serving as one explanation to why he endures as one of the greatest of classical heroes by being the embodiment of how a great man should act.

Researcher: Zin-Min Tun

Institution: University of Akron

Faculty Mentor: Dr. Claire Tessier

Lewis and Bronsted Acid-Base Chemistry of [PCl₂N]₃, the Precursor of Chlorophosphazene Polymers

Phosphazene polymers are mainly synthesized by the ring-opening polymerization (ROP) of [PCl₂N]₃ followed by functionalization with different side groups. The applications of polyphosphazenes range from biomedical materials to fire-retardant additives. However, the inefficiency and irreproducibility in the synthesis through ROP process hinder phosphazene polymers from being widely used. To study the mechanism of the ROP, we focus on the acid-base chemistry of [PCl₂N]₃. The reactions of the weak base [PCl₂N]₃ with Lewis acids gave adducts [PCl₂N]₃.MX₃ (MX₃ = AlCl₃, AlBr₃, GaCl₃) under rigorous anaerobic conditions and superacid adducts [PCl₂N]₃.HMX_{m+1} (HMX_{m+1} = HAlCl₄, HAlBr₄, HSbCl₆) in the presence of stoichiometric quantity of water. HMX₄ was generated by MX₃ reacting with HX that was formed from the reaction of MX₃ with water. Since [PCl₂N]₃ was synthesized from PCl₅, PCl₅ impurities can still be present

in the ROP process. Being a weak Lewis acid, PCl_5 reacts with trace of water to give marginally stable superacid HPCl_6 . The presence of HPCl_6 in the ROP process might be responsible for the irreproducibility of the process. To understand the chemistry of HPCl_6 , the more stable superacid adducts were characterized by X-ray crystallography, and multi-nuclear and variable-temperature NMR studies.

Researcher: Joseph Tucker

Institution: University of Akron

Faculty Mentor: Dr. Jerry Young

An Integrated Approach to Economic Growth Modeling

Economic growth is one of the rising areas of study within the field. What factors attribute to a country's growth? This presentation considers a three sector economy, with sectors of production, production education, and health education, to consider the effects of longevity and well-being on economic productivity and growth. On a more technical level, this presentation is set within a mathematical confine that uses Hamiltonian techniques as well as numerical approximation to model the economy through a set of five governing equations including capital, consumption, human skill level, daily production education allotment and daily health education allotment. Overall it is the aim of this presentation to economically deem or disapprove of health aid and interaction in developing countries. Does time spent in health education improve the economic definitions of standard of living?

Researcher: Gokce Ugur, Bulent Akgun, Zhang Jiang, Suresh Narayanan, Heeju Lee, Sanghoon Song, William Brittain, Sunil Sinha, Hyunjung Kim, and Dr. Mark Foster

Institution: University of Akron

Faculty Mentor: Dr. Mark Foster

DYNAMICS OF HOMOPOLYMER BRUSHES

The surface dynamics of polystyrene (PS) and poly(*n*-butyl acrylate) (PnBA) homopolymer brushes synthesized using atom transfer radical polymerization were investigated by X-ray photon correlation spectroscopy for the first time. Within the range of time (0.2 - 1100 s) and length scale (0.2-5 μm) studied, no fluctuations of the brush surfaces were detectable. When PS brushes of thicknesses in the range of 9-101 nm with high grafting density (>0.5 chains/ nm^2) were considered, relaxation is not visible with variation of thickness, temperature and in-plane wave-vector. Even the variation of grafting density from 0.6 to 0.1 does not bring the relaxation into the window. For PnBA brushes 130C above the bulk glass transition temperature, no relaxation process was observed. These measurements have revealed that the surface fluctuations in a particular time and q window are suppressed on homopolymer brushes which is a result of covalent tethering and consistent with the predictions of Fredrickson and co-workers.

Researcher: Nancy Varian

Institution: University of Akron

Faculty Mentor: Dr. Evangeline Newton

Beliefs and Instructional Practices of Culturally Relevant Educators: A Qualitative Case Study

This study focuses on practicing teachers who work in culturally diverse classrooms or work with heterogeneous groups and use culturally relevant pedagogy in their classroom setting. The study examines how teachers describe their personal and/or professional experiences, what has influenced their practice, and the impact of these beliefs on their classroom practice. The research examines what instructional patterns, if any, occur in the classroom practices of educators who

choose to use culturally relevant instructional methods. Similarities and differences in practice are explored in order to better understand culturally relevant practice as utilized by these teachers.

Researcher: Abhay Vasudev and Dr. Jiang Zhe

Institution: University of Akron

Faculty Mentor: Dr. Jiang Zhe

A CAPILLARY MICROGRIPPER USING ELECTROWETTING ON DIELECTRIC

Current MEMS devices are fabricated by monolithic micromachining in which all components are fabricated in one sequential process. Hybrid microsystems having complex 3-D geometries and multiple micro-components cannot be manufactured using monolithic micromachining. In these situations, assembly of micron-sized parts is necessary. Gripping techniques using micro-grippers and manipulation tools are needed to accomplish micro-assembly tasks.

A novel capillary microgripper based on the electrowetting principle to pick up and release objects has been demonstrated here. The gripper utilizes capillary forces as the gripping mechanism, a dominant force at the micro scale, evolving from a liquid bridge between two solid surfaces. The microgripper consists of interdigitated radial coplanar gold electrodes to which a driving voltage is applied; a thin hydrophobic insulator separates the droplet from the electrodes.

When electric potential is applied, the contact angle of the droplet reduces from an initial high to a low contact angle. The lifting force is at maximum for the lowest contact angle and reduces with increase in contact angle. Thus through contact angle manipulation the lifting force can be regulated for object pick-up and release. Preliminary testing has successfully demonstrated the pickup-release of micro glass beads (7.8 to 13.9 milligrams) using this microgripper.

Researcher: Tom Vo, Matt Taschner, Tom Gambone, and Antoinio Samuel

Institution: University of Akron

Faculty Mentor: Dr. Julie Zhao

Design and Implementation of an Intelligent Balloon for Real-time Environment Monitoring

With continuous funding from the Ohio Space Grant Consortium, an intelligent balloon has been designed, assembled, launched, and tracked by an undergraduate team at the University of Akron. The balloon team has conducted two successful launches, one of which reached about 95,000 feet. Real-time sensor information of the external and internal environment of the payload was transmitted via a wireless link. The tracking information was also transmitted in order to provide a means of recovering the balloon payload after landing. This paper represents the design and implementation of the wireless Data Sensor Transceiver Unit (DTSU) designed by an electrical engineering team, which cooperated with a mechanical engineering team.

The DTSU system consists of a communication system, data acquisition system, and a control relay system. The communication devices operate on amateur radio frequencies and use built-in Terminal Node Controllers to transmit a pre-determined fixed length data packet. The data packet contains measurements taken by the data acquisition system. These measurements include atmospheric temperature, humidity, pressure, and GPS coordinates which are monitored throughout the balloon's launch and flight. Sending this data to the base-station located within the chase vehicle allowed the engineering teams to do real-time tracking of the balloon for faster payload recovery. The DTSU also contains relays that activate picture taking, a payload cutting device, and audio beacon. Pictures were set to be taken periodically throughout the journey of the balloon. The payload cutting device was activated at a chosen altitude which was determined using

the GPS device. Lastly, the audio beacon was activated by timer as a method of locating the balloon upon landing.

The payload box containing the DTSU system was designed with the consideration that the payload may undergo heavy vibrations, experience extremely cold temperatures, strong impacts upon landing, and possibly even land in water. The payload and contents were designed as rugged as possible because a failure in the system due to software (i.e. getting lost in loop), hardware (i.e. severed connection), or a combination of both may cause loss of tracking information and most likely the loss of the payload.

Researcher: Maurice Wadley

Institution: University of Akron

Faculty Mentor: Dr. Kevin Cavicchi

Thin Films of PDMS-containing Block Copolymers: The Role of the Opposing Block on the Morphology

The self-assembly of block copolymers into ordered nanostructures such as spheres, cylinders, and lamellae in the range of 10-100 nm makes them interesting materials for patterning surfaces. Thin films of block copolymers containing poly(dimethylsiloxane) (PDMS) are attractive for patterning due to their high oxygen etch resistance compared to other polymers. The main disadvantage of these polymers for patterning is the low surface tension of PDMS. This causes the preferential migration of PDMS to the air/film interface driving the formation of domains parallel to the interface and surface wetting layers. In this work a series of AB block copolymers containing PDMS have been prepared where the surface tension of the opposing block was varied. The effect of changing the surface tension mismatch between the blocks on the thin film morphology will be discussed.

Researcher: Sandra Wehmann

Institution: University of Akron

Faculty Mentor: Dr. David Ritchey

Lab Accident at Private School: A Case Study in Public Relations

On January 23, 2006, a simple chemistry experiment to create the colors of the rainbow resulted in a fireball that seriously burned six students, a teacher, and her son at Western Reserve Academy. The first priority in such a crisis is immediate medical attention for the victims and the safety of other students at the school. The public relations director then faces a secondary crisis in dealing with the media, parents, Board of Trustees, past and potential supporters, public opinion, and the inevitable liability issues. A private school depends upon reputation, enrollment, and donors for its success and a significant accident like this can negatively impact all three. How well a crisis is handled depends in large measure on whether there is a crisis plan prepared in advance and how well it is implemented. Western Reserve had such a plan in place and was able to react swiftly and appropriately to the unfolding events. This case study will examine how a crisis preparation plan guided the actions of the administration and public relations department of Western Reserve Academy.

Researcher: Jie Wen
Institution: University of Akron
Faculty Mentor: Dr. Fred Choy

Identification of gear and bearing damage in a transmission system

As gear and bearing are the most universally used machine elements, research on methods for detecting faults in a transmission system has been developing for many years. The main objective of this project is to identify the individual and the combined wear/damage in gear teeth and rolling element bearings based on vibration signatures. The vibration signatures obtained are compared in the original time domain, the frequency domain using the Fast Fourier Transform (FFT), the joint time-frequency domain using the Wigner-Ville Distribution (WVD). Vibration signatures from cases with no gear tooth or rolling element bearing damage (baseline healthy machine), preset gear tooth damage only, preset rolling element bearing damage only, and preset damages in both gear tooth and rolling element bearing system are examined. Based on the results of this comparative study, special features in the vibration signatures for each type of damage are identified and categorized. Using the categorized results, general conclusions are drawn concerning the identification of both individual and combined gear tooth and rolling element bearing damages.

Researcher: Sara Whitson
Institution: University of Akron
Faculty Mentor: Dr. Chrys Wesdemiotis

Atmospheric Ionization: A Comparison of poly(styrene) Ionization Using a Library of Cations

Atmospheric Pressure Chemical Ionization (APCI) excels in the analysis of hydrophobic samples; commonly employed for the investigation of biomolecules, this method is more suitable than the more common, Electrospray Ionization (ESI), for nonpolar polymers. Two such polymers, poly(styrene) and poly(methyl styrene) are studied here with a library of cationizing agents in order to determine the optimum conditions that generate clean mass spectra as well as tandem mass spectra with both the ESI and APCI sources.

The tested library of cations consisted mostly of alkali earth metal, copper and silver salts with similar or the same counter ion; these cations and the selected poly(styrene)s were dissolved at 1mg/mL in a 9:1 (v:v) Tetrahydrofuran:Methanol mixture; these solutions were then mixed at a ratio of 1:1 (v:v). Trifluoroacetic acid was also tested for its ability to protonate the sample; 1% of the total volume was added to the poly(styrene). With APCI, regardless of polymer, larger cations more readily attached to the polymer and generated a cleaner spectrum; however, with ESI, only the silver cation was able to successfully charge either polymer. This trend clearly showed the superiority of the APCI source in ionizing both polymers.

Researcher: Brittany Widner, Rebecca Drenovsky, and Jean Pan
Institution: University of Akron
Faculty Mentor: Dr. Jean Pan

Chemical Composition of Graminoid Plant Species After Application of Fertilizer and Presence of Plant Litter

Anthropogenic nitrogen inputs can lead to eutrophication in an ecosystem, often resulting in a loss of biodiversity. The affect of anthropogenic inputs is being investigated in an on-going experiment at the University of Akron Field Station; fertilizer and plant litter are being manipulated to vary resource inputs on 24 experimental plots. These changes have caused plant biomass to increase while plant diversity has decreased. The effects of fertilization and litter removal may be species

dependent because plants differ in nitrate uptake and reduction capabilities. We examined whether resource inputs affect plant tissue quality, using carbon:nitrogen (C:N) ratios, in five species. Because fertilized plants and plants with litter intact have higher biomasses, we hypothesized that these plants will have greater tissue nitrogen and lower C:N ratios compared to control plants. Thus far, we have found that fertilization leads to lower C:N ratios for some species. In two species, plots with litter removed had lower C:N ratios when compared to plots with both nitrogen addition and litter removal. We observed no difference between control plots and these plots suggesting a connection between litter removal and nitrogen uptake. Overall, an increase in resources via nitrogen input leads to increased nitrogen in certain plants.

Researcher: Wesley Wilkins
Institution: University of Akron
Faculty Mentor: Brain Pendleton

The Stigma of HIV/AIDS among African American males

Several studies have examined the stigma HIV/AIDS carries among African American males. Even though African Americans make up 12 percent of the total population in the United States of America, they alone account for a significant number of those infected with HIV. According to the Center for Disease Control, HIV is the fourth leading cause of death for black men in the United States. HIV also is the highest death rate per 100,000 black males aged 25-44 at 39.9%. Through all the awareness media programs emphasizing the deadliness of AIDS, why are black men still contracting HIV at alarming levels?

We are running out of solutions to reducing the HIV pandemic in black communities. This research paper will address why black males are more infected than any other ethnic group. To answer this question, the study will use secondary data from relevant sources and quantitative research to show how HIV is affecting African American men. Content analysis displayed from this type of research will immediately direct attention to the HIV prevalent rate killing black men by the numbers. This disease has continued to eradicate half of the African American male population.

Researcher: Emily Woodward
Institution: University of Akron
Faculty Mentor: Dr. Lisa Park

Geochemical and Faunal Variability of Ostracode Faunas from Saline Ponds on San Salvador Island, Bahamas—An Integrated Taxonomic and Geochemical Atlas

Ostracode are microcrustaceans that live in all types of aquatic environments. Eleven lakes on a tropical island in the Bahamas were examined for ostracodes to determine their diversity and distribution, particularly with respect to lake salinity. These data have been compiled and placed into the first taxonomic and geochemical atlas of Caribbean ostracodes. This database was developed using standard PC-based database software and consists of over 60 senior synonym species records that include morphologic descriptions, ESEM images, distribution maps and geochemical tolerances. This database will be made available online and, in time, will be expanded to include the greater Caribbean basin as well as core and stratigraphic distributions, providing a major step toward stabilizing taxonomic concepts of non-marine Caribbean ostracode species.

From this database, several patterns emerged regarding species distribution and abundance: 1) lake salinity was found to correlate with alpha diversity and the highest diversity occurred at the calcite branchpoint, 2) there is little correlation between species distribution and geographic

proximity and 3) dissimilar faunas occurred in adjacent lakes with similar chemistry. This database will help future researchers understand changes in ostracode faunas through core sediments.

Researcher: Amy Yee

Institution: University of Akron

Faculty Mentor: Dr. Carolyn Sutter

Smoking Status as a Vital Sign

It is believed that the implementation of smoking status as a vital sign in the primary care setting may be beneficial in triggering healthcare providers to give smoking cessation support and assistance during the patient encounter. This project reviews past research on this topic and identifies what has been beneficial in primary care offices in regards to identifying smokers and providing smoking cessation advice. There appears to be an overall increase in primary care provider support with smoking cessation in the clinics that implemented a smoking status vital sign. I plan to implement a similar vital sign tool in my current primary care office in an effort to increase compliance with providing smoking cessation advice. Increased awareness about this topic is necessary to continue the downward trend of tobacco abuse in the United States today.

Researcher: Ruthie Youssefi and Donna Abbott

Institution: University of Akron

Faculty Mentor: Dr. Peg DiMarco

Child Sexual Abuse Prevention Education Program

Child Sexual Abuse Prevention Program Donna Abbott and Ruthie Youssefi Child sexual abuse is a serious problem that continues to plague society. In order to protect children, adults must become educated about sexual abuse. The American Academy of Pediatrics recommends that all pediatric primary care providers address the issue of sexual abuse with parents as part of anticipatory guidance (AAP Committee on Child Abuse and Neglect, 1999). Most sexual abuse prevention programs teach children about good and bad touches. Such programs discount the fact that the offender often misleads the child into thinking the abuse is a positive thing. These types of programs place the responsibility of the abuse on the child. Newer sexual abuse prevention programs are placing the responsibility on the adult to prevent the abuse. The focus of this program will be mothers of children residing in a homeless shelter in Akron, Ohio. The program will provide education about sexual abuse prevention consisting of group discussion, distribution of printed material, and viewing a teaching PowerPoint presentation. Pre- and post-testing will be completed by the participants to evaluate the program. Nola Pender's Health Promotion Model is the theoretical basis for this program because by educating mothers about child sexual abuse they can optimize their child's health and well-being. The program is a predictive positive influence.

Researcher: Shunliu Zhao

Institution: University of Akron

Faculty Mentor: Dr. Alex Povitsky

Boundary Singularity Method for Partial-slip Fibrous Filtration Flows

In this study a Stokeslet-based boundary singularity method (BSM) for two-dimensional low-Reynolds number partial-slip flows has been developed. First, the far-field uniform flow past an infinitely long cylinder is selected for the benchmark study. The numerical accuracy is investigated in terms of the location and the number of the Stokeslets. The benchmark study shows that the numerical accuracy increases when the Stokeslets are submerged deeper beneath the cylinder surface, as long as the formed linear system remains numerically solvable. The maximum

submergence depth increases with the decrease of the number of Stokeslets. As a result the numerical accuracy does not deteriorate with the dramatic decrease in the number of Stokeslets. A relatively small number of Stokeslets with a substantial submergence depth is thus chosen for modeling fibrous filtration flows. Second, the flow about a set of infinitely long cylinders confined between two planar walls is consid!

ered to represent the fibrous filter flow. The obtained pressure drop agrees very well with the experimental data for no-slip flows. The BSM is then applied to partial slip flow to investigate the slip effect at fiber-fluid interface on the pressure drop. The numerical results compare favorably with the analytical solution available for the limit case of infinite number of fibers.

Researcher: Ian Zuzarte

Institution: University of Akron

Faculty Mentor: Dr. Dale Mugler

Detection of the Onset of Nocturnal Hypoglycemia in Type 1 Diabetic Patients using the Hermite Transform

Nocturnal hypoglycemia, a pathologic state produced by a lower than normal level of glucose in the blood, while asleep, has been implicated in the sudden deaths of young people with diabetes. Experimental hypoglycemia has been found to prolong the ventricular repolarisation and to affect the T wave morphology of the electrocardiogram (ECG). It is postulated that abnormally low blood glucose could in certain circumstances, be responsible for the development of a fatal cardiac arrhythmia. This motivates the need for detection of the onset of spontaneous nocturnal hypoglycemia through monitoring of the ECG. This paper discusses a system using the recently-developed discrete Hermite transform and a certain rule-base to monitor ECG features and raises alarms if abnormalities corresponding to hypoglycemia are detected. This study supports the hypothesis proposing a relationship between cardiac function and abnormally low blood glucose. The algorithm developed is computationally fast and can be used in future for real time analysis.