



Department of Integrated Science and Technology

16th Annual 2012
Senior Capstone Project
Presentation Symposium
Fri. April 13
8:30am-5:30pm
ISAT and HHS Buildings

JAMES MADISON UNIVERSITY®
College of Integrated Science and Technology

Integrated Science and Technology Program

CAPSTONE PRESENTERS

FIRST NAME	LAST NAME	PRESENTATION TIME	PRESENTATION LOCATION	ABSTRACT Page No.	PROJECT ADVISOR
Sarah	Abouzied	3:00-3:40 p.m.	ISAT Room 337	42	Dr. Anthony Teate
Jackson	Adolph	1:30-2:30 p.m.	HHS Rm. 1302	54	Dr. Chris Bachmann
Andrew	Augustine	10:45-11:10 a.m.	ISAT Room 150	27	Dr. Jonathan Miles
Timothy	Austen	11:00-11:20 a.m.	ISAT Room 148	15	Dr. Chris Bachmann
David	Berberich, II	2:00-2:40 p.m.	ISAT Room 350	50	Dr. Robert Brent
Mary Kate	Brannon	2:30-2:55 p.m.	ISAT Room 136	9	Dr. Amanda Biesecker
Byron	Bundoc	1:00-1:40 p.m.	ISAT Room 150	29	Dr. Tony Chen
Ryan	Cangelosi	2:15-2:55 p.m.	ISAT Room 337	41	Dr. Anthony Teate
Michael	Coleman	10:00-10:40 a.m.	ISAT Room 350	45	Dr. Eric Maslen
Ryan	Cook	4:00-4:40 p.m.	ISAT Room 350	53	Dr. Robert Brent
Madeline	Culbreth	8:30-8:55 a.m.	ISAT Room 348	90	Dr. Ronald Raab
Eric	Daley	10:00-10:40 a.m.	ISAT Room 350	45	Dr. Eric Maslen
Nana	Darko	4:30-4:55 p.m.	ISAT Room 337	44	Dr. Emil Salib
Spencer	Davis	2:00-2:40 p. m.	ISAT Room 350	50	Dr. Robert Brent
Julianne	Decker	4:15-5:00 p.m.	ISAT Room 150	34	Dr. Wayne Teel
Michael	DePaola	1:30-2:30 p.m.	HHS Rm. 1302	54	Dr. Chris Bachmann
Mary Kathryn	Dickinson	10:00-10:25 a.m.	ISAT Room 136	7	Dr. Louise Temple
Andrew	Duong	3:45-4:25 p.m.	ISAT Room 337	43	Dr. Nicole Radziwill
James	Escano	10:30-10:55 a.m.	ISAT Room 136	8	Dr. Louise Temple Dr. Nick Luden
Jason	Farber	9:00-9:40 a.m.	ISAT Room 337	35	Dr. Morgan Benton
Daniel	Ferrante	1:30-1:55 p.m.	ISAT Room 148	19	Mr. Paul Goodall
Brian	Ford	10:30-11:10 a.m.	ISAT Room 337	37	Dr. Morgan Benton
Robert	Fryinger	2:40-2:55 p.m.	ISAT Room 150	31	Dr. Maria Papadakis
Christopher	Gogoel	10:30-11:10 a.m.	ISAT Room 337	37	Dr. Morgan Benton
Warren	Grabenstetter	3:00-3:40 p.m.	ISAT Room 150	32	Dr. David Lawrence
David	Grayson	3:00-3:40 p.m.	ISAT Room 337	42	Dr. Anthony Teate
Sean	Hallett	11:15-11:55 a.m.	ISAT Room 350	47	Dr. George Baker
Michael	Hamill	4:00-4:40 p.m.	ISAT Room 350	53	Dr. Robert Brent
Alex J.	Haney	9:00-9:40 a.m.	ISAT Room 150	25	Dr. Karim Altaii
Andrew	Harrison	2:00-2:25 p.m.	ISAT Room 148	20	Mr. Paul Goodall
Brad	Hershey	2:30-3:10 p.m.	ISAT Room 148	21	Mr. Paul Goodall
Gareth	Hermann	10:00-10:55 a.m.	ISAT Room 148	14	Dr. Chris Bachmann
Michael	Hill	10:00-10:40 a.m.	ISAT Room 350	45	Dr. Eric Maslen
Trevor	Hoffman	3:15-3:55 p.m.	ISAT Room 148	22	Mr. Paul Goodall
Kettie	Holland	10:45-11:10 a.m.	ISAT Room 350	46	Dr. James Barnes
James	Hounshell	4:30-4:55 p.m.	ISAT Room 136	13	Dr. Robert McKown
Matthew	Hurd	11:15-11:55 a.m.	ISAT Room 337	38	Dr. Morgan Benton
Christopher	Jackson	1:45-2:10 p.m.	ISAT Room 337	40	Dr. Anthony Teate
Blake	Jenkins	3:45-4:25 p.m.	ISAT Room 337	43	Dr. Nicole Radziwill
Charles	Johnson	11:15-11:55 a.m.	ISAT Room 150	28	Dr. Jonathan Miles

Integrated Science and Technology Program (cont'd)

CAPSTONE PRESENTERS

FIRST NAME	LAST NAME	PRESENTATION TIME	PRESENTATION LOCATION	ABSTRACT Page No.	PROJECT ADVISOR
David	Keeling	1:00-1:25 p.m.	ISAT Room 350	48	Dr. Thomas Benzing
Nick	Kerschl	3:45-4:25 p.m.	ISAT Room 337	43	Dr. Nicole Radziwill
Christopher	Keys	3:45-4:10 p.m.	ISAT Room 150	33	Dr. Wayne Teel
Andrew	Knoll	3:00-3:40 p.m.	ISAT Room 150	32	Dr. David Lawrence
Patrick	Knowlan	1:00-1:40 p.m.	ISAT Room 337	39	Dr. Anthony Teate
Jonathan	Lyons	4:00-4:40 p.m.	ISAT Room 148	23	Dr. Paul Goodall
Adam	Maas	9:00-9:40 a.m.	ISAT Room 337	35	Dr. Morgan Benton
Joshua	Magura	3:50-4:50 p.m.	HHS Rm. 1302	56	Dr. Chris Bachmann
Alex	Mastro	11:15-11:55 a.m.	ISAT Room 337	38	Dr. Morgan Benton
Amanda	Martindale	4:15-5:00 p.m.	ISAT Room 150	34	Dr. Wayne Teel
Sean	McMillin	3:45-4:25 p.m.	ISAT Room 337	43	Dr. Nicole Radziwill
William	Meissner	11:50-12:15 p.m.	ISAT Room 148	17	Dr. Chris Bachmann Mr. Mike Davis
Joseph	Meyler	2:15-2:55 p.m.	ISAT Room 337	41	Dr. Anthony Teate
Brendan	Moran	2:45-3:25 p.m.	ISAT Room 350	51	Dr. Robert Brent
Mark	Morris	9:45-10:25 a.m.	ISAT Room 337	36	Dr. Morgan Benton
Marlee	Najamy-Winnick	4:15-5:00 p.m.	ISAT Room 150	34	Dr. Wayne Teel
Bernard	Newman	2:40-3:40 p.m.	HHS Rm. 1302	55	Dr. Chris Bachmann
Timothy	Niles	4:00-4:40 p.m.	ISAT Room 148	23	Mr. Paul Goodall
Shayan	Noushabadi	11:25-11:45 a.m.	ISAT Room 148	16	Dr. Chris Bachmann Mr. Paul Goodall
Randy	Ortanez	3:15-3:55 p.m.	ISAT Room 148	22	Mr. Paul Goodall
Sarah	Osorio	3:00-3:40 p.m.	ISAT Room 337	42	Dr. Anthony Teate
Mark	Ostrander	1:00-1:40 p.m.	ISAT Room 337	39	Dr. Anthony Teate
Matthew	Penning	3:30-3:55 p.m.	ISAT Room 350	52	Dr. Robert Brent
Zachary	Peterson	1:45-2:10 p.m.	ISAT Room 150	30	Dr. Tony Chen
Andrew	Pharr	4:45-5:10 p.m.	ISAT Room 148	24	Mr. Paul Goodall
Michael	Phillips	1:00-1:25 p.m.	ISAT Room 148	18	Dr. Abdelrahman Rabie
Alex	Proffitt	1:30-1:55 p.m.	ISAT Room 350	49	Dr. Robert Brent
Jake	Rasmussen	2:15-2:35 p.m.	ISAT Room 150	31	Dr. Maria Papadakis
Jared	Roberts	3:50-4:50 p.m.	HHS Rm. 1302	56	Dr. Chris Bachmann
Eric	Rothschild	3:00-3:40 p.m.	ISAT Room 150	32	Dr. David Lawrence
John	Samaha	2:45-3:25 p.m.	ISAT Room 350	51	Dr. Robert Brent
James	Schavel, Jr.	11:15-11:55 a.m.	ISAT Room 350	47	Dr. George Baker
Brian	Scheerer	2:30-3:10 p.m.	ISAT Room 148	21	Mr. Paul Goodall
Adam	Scharf	4:30-4:55 p.m.	ISAT Room 136	13	Dr. Robert McKown
Benjamin	Schulze	9:45-10:40 a.m.	ISAT Room 150	26	Dr. Karim Altaii
Madison	Shinaberry	8:30-8:55 a.m.	ISAT Room 348	90	Dr. Ronald Raab
Michael	Sliwinski	11:15-11:55 a.m.	ISAT Room 337	38	Dr. Morgan Benton
Jan	Smith	3:45-4:25 p.m.	ISAT Room 337	43	Dr. Nicole Radziwill

Integrated Science and Technology Program (cont'd)

CAPSTONE PRESENTERS

FIRST NAME	LAST NAME	PRESENTATION TIME	PRESENTATION LOCATION	ABSTRACT Page No.	PROJECT ADVISOR
Brent	Snyder	1:00-1:40 p.m.	ISAT Room 150	29	Dr. Tony Chen
Cara	Soyars	3:00-3:25 p.m.	ISAT Room 136	10	Dr. Robert McKown
Dorottya	Spolarics	4:15-5:00 p.m.	ISAT Room 150	34	Dr. Wayne Teel
David	Stevens	9:45-10:40 a.m.	ISAT Room 150	26	Dr. Karim Altaï
Katherine	Still	3:30-3:55 p.m.	ISAT Room 136	11	Dr. Robert McKown Dr. Kyle Seifert
Yannick	Tamm	11:15-11:55 a.m.	ISAT Room 150	28	Dr. Jonathan Miles
Jessica	Taylor	9:45-10:40 a.m.	ISAT Room 150	26	Dr. Karim Altaï
Stephen	Tkac	2:15-2:35 p.m.	ISAT Room 150	31	Dr. Maria Papadakis
Tim	Teague	3:50-4:50 p.m.	HHS Rm. 1302	56	Dr. Chris Bachmann
Scott	Teigeler	2:40-3:40 p.m.	HHS Rm. 1302	55	Dr. Chris Bachmann
John	Turner	3:45-4:25 p.m.	ISAT Room 337	43	Dr. Nicole Radziwill
Jason	Wallace	9:00-9:40 a.m.	ISAT Room 150	25	Dr. Karim Altaï
Shaun	Watson	9:45-10:25 a.m.	ISAT Room 337	36	Dr. Morgan Benton
Jeffrey	Wiggins	2:40-3:40 p.m.	HHS Rm. 1302	55	Dr. Chris Bachmann
Jacob	Wolpe	4:00-4:25 p.m.	ISAT Room 136	12	Dr. Robert McKown
Nicholas	Wright	8:30-8:55 a.m.	ISAT Room 348	90	Dr. Ronald Raab

GEOGRAPHIC SCIENCE PROGRAM

CAPSTONE PRESENTERS

FIRST NAME	LAST NAME	PRESENTATION TIME	PRESENTATION LOCATION	ABSTRACT PAGE No.	PROEJCT ADVISOR
Daniel	Bartrick	4:15-4:40 p.m.	HHS Rm 1207	74	Dr. John Gentile
Jonathan	Belmonte	11:00-11:25 a.m.	HHS Rm 1209	78	Dr. Maria Papadakis
Scott	Bentley	11:00-11:25 a.m.	HHS Rm 1209	78	Dr. Maria Papadakis
Darci	Bohmer	2:30-2:55 p.m.	HHS Rm 1207	71	Dr. Mary Tacy
Peter	Bonsall	1:30-1:55 p.m.	HHS Rm 1204	62	Dr. Amy Goodall
David	Batteiger	2:15-2:40 p.m.	HHS Rm 1202	58	Dr. Zachary Bortolot
John	Caccavale	3:00-3:40 p.m.	HHS Rm 1207	72	Dr. Mary Tacy Dr. James Wilson
Alvaro	Campomanes	4:15-4:40 p.m.	HHS Rm 1207	74	Dr. John Gentile
Mark	Castle	2:45-3:25 p.m.	HHS Rm 1202	59	Dr. Zachary Bortolot
Grant	Collier	POSTER	HHS Hallway	86	Dr. Henry Way
Lindsay	Cutchins	3:00-3:40 p.m.	HHS Rm 1204	65	Dr. Amy Goodall Dr. Wayne Teel
Gregory	De Angelus	2:00-2:25 p.m.	HHS Rm 1204	63	Dr. Amy Goodall
Devin	Diver	4:15-4:40 p.m.	HHS Rm 1207	74	Dr. John Gentile
Leo	Dove	1:30-1:55 p.m.	HHS Rm 1209	79	Dr. Michael Deaton
Michael	Eastham	3:30-3:55 p.m.	HHS Rm 1209	83	Dr. Helmut Kraenzle
Andrew	Farrar	1:00-1:25 p.m.	HHS Rm 1207	68	Dr. Mary Tacy
Stephen	Fessenden	POSTER	HHS Hallway	87	Dr. Jennifer Coffman
Rachel	Frischeisen	3:45-4:10 p.m.	HHS Rm 1204	66	Dr. Amy Goodall
William	Gilrain	4:00-4:25 p.m.	HHS Rm 1209	84	Dr. Helmut Kraenzle
Austin	Gore	3:45-4:10 p.m.	HHS Rm 1207	73	Dr. Mary Tacy
David	Grosso	1:00-1:40 p.m.	HHS Rm 1202	57	Dr. Zachary Bortolot
Alexander	Haney	POSTER	HHS Hallway	88	Dr. John Gentile
Robert	Heidelbach	2:00-2:25 p.m.	HHS Rm 1209	80	Dr. Michael Deaton Dr. Henry Way
David	Hertle, Jr.	11:30-11:55 a.m.	HHS Rm 1209	78	Dr. James Wilson
Caryle	Keller	POSTER	HHS Hallway	89	Dr. John Gentile
Leslie	Keller	4:45-5:10 p.m.	HHS Rm 1207	75	Dr. John Gentile
Tim	Kennedy	3:00-3:40 p.m.	HHS Rm 1207	72	Dr. Mary Tacy Dr. James Wilson
Jason	Lieu	1:30-1:55 p.m.	HHS Rm 1209	79	Dr. Michael Deaton
Lindsey	Luria	4:00-4:25 p.m.	HHS Rm 1202	61	Dr. Jennifer Coffman

GEOGRAPHIC SCIENCE PROGRAM (cont'd)**CAPSTONE PRESENTERS**

FIRST NAME	LAST NAME	PRESENTATION TIME	PRESENTATION LOCATION	ABSTRACT PAGE No.	PROJECT ADVISOR
Michael	Mayobre	3:00-3:25 p.m.	HHS Rm 1209	82	Dr. Helmut Kraenzle
Stefan	McFayden	10:30-10:55 a.m.	HHS Rm 1209	77	Dr. Henry Way
Kevin	McMillan	1:00-1:40 p.m.	HHS Rm 1202	57	Dr. Zachary Bortolot
Brian	Moran	4:30-4:55 p.m.	HHS Rm 1209	85	Dr. Helmut Kraenzle
Jake	Morris	1:45-2:10 p.m.	HHS Rm 1202	58	Dr. Zachary Bortolot
John	Pettitt	2:00-2:25 p.m.	HHS Rm 1207	70	Dr. Mary Tacy Dr. Zachary Bortolot
Lisbeth	Rasmussen	3:00-3:40 p.m.	HHS Rm 1204	65	Dr. Amy Goodall Dr. Wayne Teel
Zachary	Samuelson	1:30-1:55 p.m.	HHS Rm 1207	69	Dr. Mary Tacy Dr. James Wilson
Jonathan	Sanders	1:00-1:40 p.m.	HHS Rm 1202	57	Dr. Zachary Bortolot
Eric	Schwind	1:00-1:40 p.m.	HHS Rm 1202	57	Dr. Zachary Bortolot
Zachary	Smith	1:30-1:55 p.m.	HHS Rm 1209	79	Dr. Michael Deaton
Natalie	Stickel	4:15-4:40 p.m.	HHS Rm 1207	74	Dr. John Gentile
Sean	Suter	4:15-4:40 p.m.	HHS Rm 1204	67	Dr. Amy Goodall
Patrick	Trimble	10:00-10:25 a.m.	HHS Rm 1209	76	Dr. Carol Nash
William H	Weaver	2:30-2:55 p.m.	HHS Rm 1209	81	Dr. Helmut Kraenzle
Carter	Wells	2:30-2:55 p.m.	HHS Rm 1204	64	Dr. Amy Goodall
Lee	Winslow, IV	2:45-3:25 p.m.	HHS Rm 1202	59	Dr. Zachary Bortolot
Robert	Woodside	3:30-3:55 p.m.	HHS Rm 1202	60	Dr. Zachary Bortolot

INTELLIGENCE ANALYSIS PROGRAM

CAPSTONE PRESENTERS

FIRST NAME	LAST NAME	PRESENTATION TIME	PRESENTATION LOCATION	ABSTRACT Page No.	PROJECT ADVISOR
Faris	Al-Nsour	1:30-1:50 p.m.	ISAT Room 348	96	Dr. George Baker Dr. Jeffrey Tang
Katelyn	Bledsoe	2:50-3:10 p.m.	ISAT Room 348	97	Dr. Jeffrey Tang
Andres	Bonett-Endara	11:15-11:40 a.m.	ISAT Room 348	94	Dr. Jeffrey Tang Dr. Michael Deaton
Allen	Frazier	9:25-9:45 a.m.	ISAT Room 348	91	Dr. Jeffrey Tang
Joshua	Frye	1:00-1:25 p.m.	ISAT Room 348	95	Dr. Jeffrey Tang Dr. Henry Way
Scott	Garrison	11:45-12:10 p.m.	ISAT Room 348	95	Dr. Jeffrey Tang
Ryan Peter	Gordon	1:55-2:20 p.m.	ISAT Room 348	96	Dr. Jeffrey Tang
Brendan	Hanrahan	11:15-11:40 a.m.	ISAT Room 348	94	Dr. Jeffrey Tang Dr. Michael Deaton
Heather	Imoehl	10:25-10:45 a.m.	ISAT Room 348	93	Dr. Jeffrey Tang
James	Kalina	1:55-2:20 p.m.	ISAT Room 348	96	Dr. Jeffrey Tang
Michael	Kelly	10:50-11:10 a.m.	ISAT Room 348	93	Dr. Jeffrey Tang
Kristyl	Lankford	9:50-10:20 a.m.	ISAT Room 348	92	Dr. Jeffrey Tang
Patrick	Mellon	1:00-1:25 p.m.	ISAT Room 348	95	Dr. Jeffrey Tang Dr. Henry Way
Caroline	Merz	11:45-12:10 p.m.	ISAT Room 348	95	Dr. Jeffrey Tang
Ashley	Mullins	3:50-4:10 p.m.	ISAT Room 348	98	Dr. Jeffrey Tang
Ashley	Papen	9:50-10:20 a.m.	ISAT Room 348	92	Dr. Jeffrey Tang
Matthew	Redabaugh	4:15-4:35 p.m.	ISAT Room 348	99	Dr. Jeffrey Tang
Alison	Schroeder	9:50-10:20 a.m.	ISAT Room 348	92	Dr. Jeffrey Tang
Curtis	Smith	9:00-9:20 a.m.	ISAT Room 348	91	Dr. Jeffrey Tang Dr. George Baker
Evan	Waranowski	2:25-2:45 p.m.	ISAT Room 348	97	Dr. Jeffrey Tang
Michael	Yates	3:15-3:35 p.m.	ISAT Room 348	98	Dr. Jeffrey Tang

INTEGRATED SCIENCE AND TECHNOLOGY PROGRAM

LOCATION: ISAT – ROOM 136

Time: 10:00 - 10:25 a.m.	Presenter's Name: Mary K. Dickinson	Capstone Advisor: Dr. Louise Temple	Capstone No.: ISAT-01-12S
Concentration: Biosystems			
Capstone Title: A Bioinformatics Approach to Designing a Pan-Genomic Array Representing Viruses of Mycobacterium smegmatis			

Capstone Abstract:

Bacteriophage (bacterial virus) research has become increasingly popular in recent history due to enormous advances in genome sequencing technology. Many mycobacteriophages, or bacteriophages that only infect mycobacterium, have been sequenced, and many of the sequences are highly similar at the nucleic acid level. In order to save time and money new mycobacteriophages could be analyzed to assess similarity to known mycobacteriophages before the whole genome is sequenced. This analysis could be performed using microarray technology,



which is a diagnostic tool that employs thousands of small spots of DNA, or probes, spotted on a glass slide. The probes on the slide are exposed to sample DNA from a new mycobacteriophage, and if the sample is similar enough to the DNA sequence within the probe it would hybridize and result in a color change. In order to create probes that are representative of the mycobacteriophage genome a bioinformatics program was written using the Python programming language. Phamerator, a preexisting bioinformatics program, has the mycobacteriophages organized into 2,493 phamilies, or groups of closely related sequences. However, some of the preexisting phamilies are very large, thus causing problems when making probes that would represent the entire phamily. In order to remedy this problem the program written takes the larger phamilies and subdivides them into more similar subphamilies. This is accomplished using the phylogenetic tree provided by CLUSTALW, a multiple sequence alignment tool. Once the subphamilies were identified, probes were made using PICKY, a software program used for selecting optimal oligonucleotides. Probe specificity was then assessed using BLAST, a basic local alignment tool. Finally, the probes will be printed onto a microarray slide, using an arrayer being built by a team of engineering students, and used for preliminary genomic analysis. In future studies the program could be used to analyze gene expression amongst bacteriophages.

LOCATION: ISAT – ROOM 136

Time: 10:30 - 10:55 a.m.	Presenter's Name: James M. Escano	Capstone Advisors: -Dr. Louise Temple -Dr. Nick Luden	Capstone No.: ISAT-02-12S
Concentration: Biosystems			
Capstone Title: Analysis of DNA Concentration in Activated Tissue during the Proliferative Phase of Satellite Cells after Concurrent Exercise			

Capstone Abstract:

Purpose: Previous studies indicated that resistance exercise along with aerobic exercise would blunt cell proliferation in muscles, as shown by immunohistochemical analysis of enzymes in proliferating tissue. The goal of this study was to assess the DNA concentration of human muscle before and after resistance, aerobic, and concurrent exercise. We hypothesized that DNA concentration per mg muscle would increase with more highly proliferative tissues, mainly through resistance exercises.

Methods: Biopsies (six biopsies per eight subjects, 48 total biopsies) were obtained in conjunction with a thesis study at the Kinesiology department. Biopsies were obtained before and after resistance, aerobic, and concurrent (resistance and aerobic) protocols. DNA analysis was determined using a DNA Quantitation kit (Sigma-Aldrich). Each biopsy was weighed before homogenization in a solution provided in the kit. Biopsy measurements of 5 µL were placed into a 96-well plate and analyzed in quadruplicate in a fluorescent plate reader. The DNA standard curve measured a DNA range of 10 – 500 ng/ml.

Results: Raw data was transformed into DNA in ng/mg tissue by a series of calculations. Values ranged from ~1,000-8,000ng/mg tissue. Standard deviation of most samples was very large (~1,500 to 6,000ng/mg tissue). DNA concentration data, on average, for all post-exercise (resistance, aerobic, and concurrent) biopsies was lower than the pre-exercise samples in total DNA (ng/mg muscle wet weight) for each subject. Statistics used were simply average and standard deviation.

Conclusions: The DNA concentration data obtained did not align with the enzyme study conducted by the Kinesiology department, which found that satellite cell enzymes increased during resistance exercise. In fact, if there is a trend (unlikely due to large standard deviation) it is towards a decrease in pre- and post-measurements for all experimental groups. Additional statistical analysis, such as ANOVA or T-test, will be performed. Further analyses using a different DNA concentration measurement will be done, as well as western blots to detect relative amounts of enzymes in these muscle extracts.

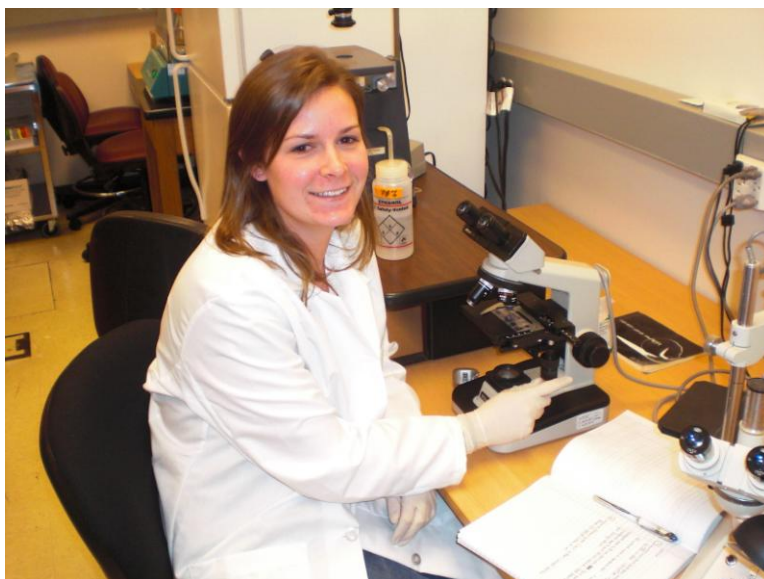
This study was done in conjunction with the JMU Kinesiology Department.

LOCATION: ISAT – ROOM 136

Time: 2:30 – 2:55 p.m.	Presenter’s Name: Mary Kate Brannon	Capstone Advisor: Dr. Amanda Biesecker	Capstone No.: ISAT-03-12S
Concentration: Biosystems			
Capstone Title: The Role of Dengue Envelope Protein in Causing Dengue Associated Arthritis			

Capstone Abstract:

Dengue virus (DENV) is a mosquito borne hemorrhagic virus of the Flavivirus genus that has become an epidemic in tropical and subtropical regions within the past few decades. DENV causes dengue fever and dengue hemorrhagic fever, which consist of fever, headache, nausea, arthritis, and hemorrhage. Dengue is commonly called “break-bone fever” because the associated muscle, bone, and joint pain greatly contribute to the morbidity of the disease. These symptoms cause



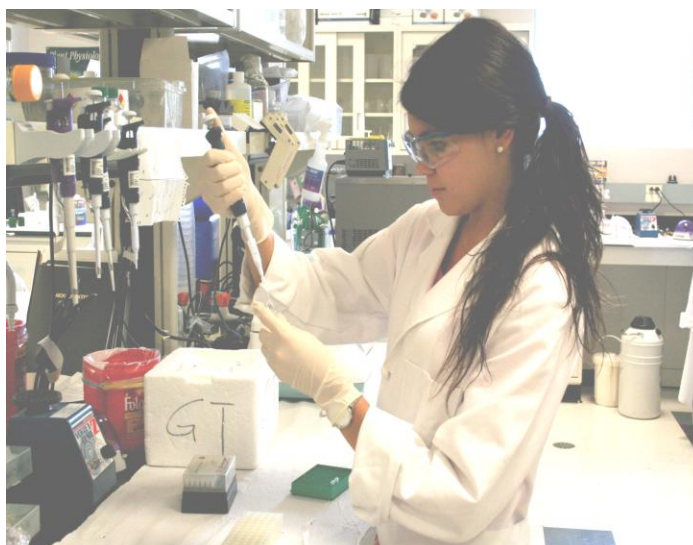
additional significant socioeconomic burdens because it results in great loss of productivity, which is especially detrimental to underdeveloped countries in which there is often only one person who is a source of income per family. No research has previously been done to determine if chondrocyte cells, the main cell population in cartilage tissues, can be infected or otherwise influenced by dengue virus. In this study, the envelope protein DENV E has been successfully expressed in insect cells, as well as bacterial cells. In future experiments, we will determine if this purified DENV E protein induces an immune response in chondrocyte cells, measured by cytokine responses. The end goal of this work is to better understand DENV’s effect on chondrocytes so that better treatments can be developed to alleviate the devastating cartilage pain associated with infection.

LOCATION: ISAT – ROOM 136

Time: 3:00 - 3:25 p.m.	Presenter's Name: Cara Soyars	Capstone Advisor: Dr. Robert McKown	Capstone No.: ISAT-04-12S
Major: Biotechnology, Honors Capstone			
Externals Sponsors: NIH National Eye Institute and Commonwealth Health Research Board			
Collaborators: University of Virginia, Eastern Virginia Medical School and Walter Reed Army Medical Center			
Capstone Title: Splice Variant of the Human Tear Protein Lacritin			

Capstone Abstract:

Purpose: Lacritin is a human tear protein that is prosecretory, mitogenic, and antimicrobial. Upon topical application, it promotes basal tearing in rabbits. A splice variant (lacritin-c) has been identified which codes for the first 65 amino acids of lacritin fused to 39 new amino acids derived from the third intron in genomic DNA. Aberrant or unregulated expression of lacritin-c may be associated with certain dry eye related ocular diseases. This work describes the development of immunoassays to detect and analyze lacritin-c in human tear samples.



Methods: Rabbit polyclonal antibodies were produced against the unique C-terminus of the lacritin-c splice variant and combined with antibodies against the N-terminus of lacritin to produce a “capture” or “sandwich” Enzyme-Linked Immunosorbent Assay (ELISA) Concentrations of antibodies were optimized in the assay and a standard curve was generated with known concentrations of recombinant lacritin-c. Western Blot analysis was used to visualize recombinant lacritin-c in human tear samples.

Results: Titration of the lacritin-c antibodies with the ELISA revealed successful detection of recombinant lacritin-c in the nanogram range. Analysis of normal human tear samples with the ELISA revealed that lacritin-c could not be detected within the limits of ELISA used; However, lacritin-c specific bands were clearly detected by Western blotting with the same antibodies and human tear samples.

Conclusions: An ELISA has been developed for the quantitation of lacritin in tears. Although the assay does not detect lacritin-c, the splice variant was apparent by Western blotting. The results suggest at least a tenfold lower level of expression of lacritin-c in normal tears compared to normal lacritin. Upregulation of inactive lacritin-c may have deleterious effects in dry eye.

LOCATION: ISAT – ROOM 136

Time: 3:30 – 3:55 p.m.	Presenter’s Name: Katherine Still	Capstone Advisors: -Dr. Robert McKown -Dr. Kyle Seifert	Capstone No.: ISAT-05-12S
Major: Biology, Honors Capstone			
Externals Sponsors: NIH National Eye Institute and Commonwealth Health Research Board			
Collaborators: University of Virginia, Eastern Virginia Medical School and Walter Reed Army Medical Center			
Capstone Title: Development of an Immunodiagnostic Assay for the Human Tear Protein Lacritin			

Capstone Abstract:

Purpose: Lacritin is a human tear protein secreted from the lacrimal gland that promotes tearing in rabbits when applied topically. Downregulation of lacritin has been hypothesized to be associated with dry eye related ocular diseases such as blepharitis, contact-lens associated dry eye, and Sjögren’s syndrome. Therefore, lacritin may be a biomarker for dry eye associated diseases. This work describes the development of an Enzyme-Linked Immunosorbent Assay (ELISA) to quantitate lacritin in human tear samples.

Methods: Antibodies were produced against the two terminal ends of the lacritin protein; the N-terminus and the C-terminus. One antibody served to capture lacritin in human tear samples and the other to detect it in a “sandwich” style ELISA. The antibodies were purified over a Protein A sepharose column and titrated against recombinant lacritin. Components of the ELISA were individually assessed and antibody dilutions were optimized via checkerboard titration. Western Blot analysis was used to visualize lacritin from human tear samples. The resulting ELISA prototype was used to detect recombinant lacritin and lacritin species in tears.

Results: Titration of the antibodies revealed successful detection of recombinant lacritin in the nanogram range. Detection of lacritin in tear samples was evident in both ELISA and western blot analysis. Lacritin was determined to represent 1-4% of total protein in tears.

Conclusion: An immunodiagnostic ELISA assay was developed for the quantitation of lacritin in human tear samples. A baseline for lacritin levels in tears was determined and can be used in future studies to compare lacritin’s prevalence and functionality in healthy and diseased tears.



LOCATION: ISAT – ROOM 136

Time: 4:00 - 4:25 p.m.	Presenter's Name: Jacob Brandon Wolpe	Capstone Advisor: Dr. Robert McKown	Capstone No.: ISAT-06-12S
Major: Biotechnology			
Externals Sponsors: NIH National Eye Institute and Commonwealth Health Research Board			
Collaborators: University of Virginia, Eastern Virginia Medical School and Walter Reed Army Medical Center			
Capstone Title: Mutational Analysis of Alpha Helical Stability in Recombinant Human Lacritin			

Capstone Abstract:

Purpose: Recombinant lacritin is stable in its secondary structure up to 90°C, maintaining a roughly constant circular dichroism profile, indicating little to no change in its alpha helical content. The current hypothesis for this structural stability centers on three salt bridges within the amphipathic alpha helix which act as stabilizing elements by pairing oppositely charged amino acids closely within the alpha helix, allowing their attractive forces to resist denaturation.



In this study, circular dichroism thermal denaturation experiments were conducted on point mutants lacking any given combination of said salt bridges in order to determine their contribution to secondary structure stability in varying temperatures.

Methods: Lacritin and salt bridge deletion mutants were prepared and standardized at a concentration of 300 ug/ml. Circular Dichroism spectra were then taken for each sample using a Jasco J-810 spectropolarimeter at 25, 40, 60 and 80°C. Alpha helical content of lacritin and each variant was then observed and recorded at 222nm. Percent alpha helical content of all samples was determined using the constrained least squares regression model.

Results: The alpha helical percent of lacritin increased by 3.66%, salt bridge mutants K66/E70 by 2.81%, K95/E99 by .88%, E103/K107 by .61%, and K66/E70-E103/K107 by 2.43% when heated from 25°C to 80°C. Salt bridge deletion mutants K66/E70-K95/E99 and K95/E99-E103/K107 had a decrease of alpha helical percent by -.28% and -3.6% respectively.

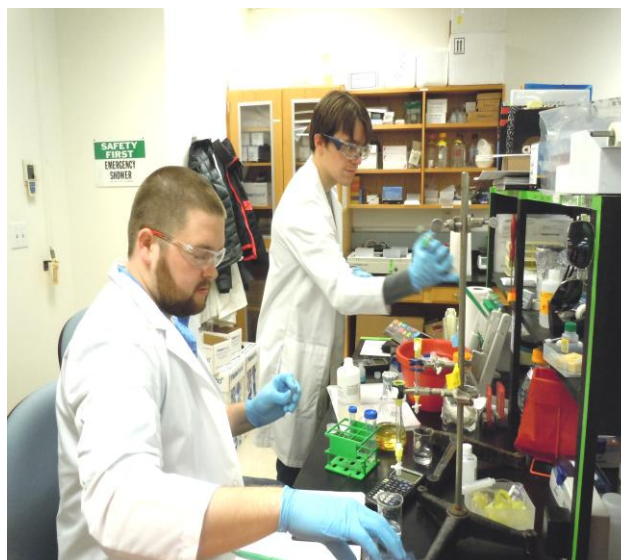
Conclusions: Although no current combination of salt bridge deletions causes a complete loss of the amphipathic alpha helix, deletions of the K66/E70-K95/E99 and K95/E99-E103/K107 salt bridges causes a significant loss of thermal stability within the alpha helix. Because a triple salt bridge deletion mutant was not created, the effect of a complete loss of all salt bridges could not be tested. Although a complete loss of all salt bridges was not tested, it can be hypothesized from previous data that it would result in a further loss of thermal stability, the degree to which thermal stability would be lost is not known, opening the door for the possibility of another means by which lacritin is thermally stable.

LOCATION: ISAT – ROOM 136

Time: 4:30 – 4:55 p.m.	Presenter's Names: -James A. Hounshell -Adam T. Scharf	Capstone Advisor: Dr. Robert McKown	Capstone No.: ISAT-07-12T
Major: Biotechnology			
Externals Sponsors: NIH National Eye Institute and Commonwealth Health Research Board			
Collaborators: University of Virginia, Eastern Virginia Medical School and Walter Reed Army Medical Center			
Capstone Title: Biochemical Characterization of the Novel Human Tear Protein Lacritin			

Capstone Abstract:

Purpose: Lacritin is a 119 amino acid protein, secreted by the lacrimal gland that is a natural component of human tears. The gene for Lacritin has been cloned into bacteria, expressed to make protein and purified to produce recombinant Lacritin. Recombinant Lacritin has been shown to stimulate new cell growth in cultured human epithelial cells, is antimicrobial, and promotes sustained tearing in rabbits after topical application. Lacritin may have potential as a new topical therapeutic for the treatment of dry eye and related ocular diseases; however, the current method of production produces only small amounts Lacritin for research and is not suitable for scale-up production. In order to develop scalable manufacturing processes for the production of recombinant Lacritin, new *E. coli* expression systems were tested and the biochemical properties of Lacritin were analyzed to assemble an efficient and cost effective purification protocol.



Methods: The gene for lacritin was cloned into an *E. coli* expression system using two different constructs; one with an intein fusion partner and the other without this fusion partner. Following expression of these constructs in *E. coli*, solubility was analyzed by SDS PAGE and ionic binding properties were determined by binding to Diethylaminoethyl sepharose (anion exchange) and Carboxymethyl Cellulose (cation exchange) chromatography resins. .

Results: Lacritin was bound to the Diethylaminoethyl sepharose column at 13.7 mM NaCl and eluted approximately at 105 mM NaCl. Lacritin was found in the flow through of the Carboxymethyl Cellulose column suggesting that little to no binding occurred even at the minimum salt concentration of 13.7 mM NaCl. The freely expressed Lacritin was not evident in SDS PAGE of insoluble pellets from culture after clean up of cell membranes and removal of trapped soluble proteins.

Conclusions: Anion and cation columns are both a viable option for purification and should be considered for future purification schemes of lacritin. Preliminary data does not suggest that lacritin without the fusion partner, forms inclusion bodies. Further studies should be conducted to determine the extent of protein loss during the standard production and purification steps.

LOCATION: ISAT – ROOM 148

Time: 10:00 – 10:55 a.m.	Presenter’s Name: Gareth Hermann	Capstone Advisor: Dr. Chris Bachmann	Capstone No.: ISAT-08-12S
Concentration: Environment			
Capstone Title: Sustainable Community Development			

Capstone Abstract:

The purpose of the documentary was to observe the current U.S. subdivision sprawl, analyze its effects on the community, and provide recommendations for a more sustainable development paradigm. In addition, the documentary is intended to educate and empower citizens to have a voice and a larger role in how our communities are developed. The methodology consisted on shooting footage in various communities such as Portland OR, Boulder CO, Burlington VT and Charlottesville VA, as well as conducting interviews with citizens, teachers and professionals. The underlying idea that cheap and abundant oil will no longer be a reality drove the progression of the documentary. Throughout the course of the documentary, good and bad examples of development were investigated. Communities of poor design had large suburban sprawls and accompanying strip malls that economically crippled the city center and diminished the sense of local community. Communities of good design had walkable downtown areas, good public transportation, a large amount of trees and parks, neighborhoods that had a sense of character, and architecture that created a sense of place. This film educates the viewer of current community development issues and inspires them to stand up and participate in the conversation in order to help shape our communities into the livable, sustainable and inspiring places they should be.



LOCATION: ISAT – ROOM 148

Time: 11:00 – 11:20 a.m.	Presenter’s Name: Timothy Austen	Capstone Advisor: Dr. Chris Bachmann	Capstone No.: ISAT-09-12S
Concentration: Information Knowledge Management			
Capstone Title: Electric Truck Conversion with Data Acquisition for JMU Facilities Management			

Capstone Abstract:

The United States is the largest consumer of petroleum in the world and this resource will soon come to an end. Technologies have improved but there is still resistance to change the dependence on the way we consume energy from petroleum. The transportation sector is the largest consumer of petroleum products. Most recently, multiple alternative fuel solutions have become available but have become



questioned about their dependability and effect on the environment both scientifically and politically. This thesis addresses both the potential to introduce electric vehicles in the U.S. and the education and awareness necessary to make a proactive, nationwide change. To explore the potential of electric vehicles in the United States, our team continued a conversion of a James Madison University service truck into a fully electric, battery powered vehicle for campus maintenance use. Auto technicians and the general public will need to better understand the new evolving technology; therefore the thesis involves a partnership with the JMU auto-technicians who have worked side by side in a living-learning laboratory. Continuing the conversion, improvements are being made to the vehicle that enhances its maintainability, durability, and mechanical abilities. In addition, a data acquisition system records performance and specifications from the truck while in use. This data will be used to analyze energy consumption, vehicle location, and control methods to improve energy efficiency that streams live to a website for the general public to monitor the truck’s progress. All these steps are in the forward direction of transforming ideals and minds toward the growing fields of sustainability and alternative energy.

LOCATION: ISAT – ROOM 148

Time: 11:25 – 11:45 a.m.	Presenter’s Name: Shayan Noushabadi	Capstone Advisors: -Dr. Chris Bachmann -Mr. Paul Goodall	Capstone No.: ISAT-10-12S
Concentration: Bio-Business			
Capstone Title: Using Forskolin Protein to Induce an Increased Melanin Production and Market the Product as a Tanning Lotion			

Capstone Abstract:

Because of cosmetic reasons, consumers have been using various methods and techniques to increase melanin production for to achieve the desired “tan.” More specifically, methods such as using tanning beds and bronzers are most popular. While tanning beds increase melanin production, they have been linked to skin cancer and bronzers tend to turn consumers orange instead of giving them a natural, glowing tan. Previous work has failed to address the issues of offering consumers a safe, effective, natural tan. The forskolin protein, extracted from the *Plectranthus barbatus* plant, when applied topically to human skin, is expected to increase melanin production safely and effectively therefore giving consumers a natural tan. Since the FDA classified forskolin as a drug, the purpose of this study is to investigate the necessary IRB and FDA actions to construct a cost analysis to determine the economic viability of creating a forskolin-tanning lotion.



LOCATION: ISAT – ROOM 148

Time: 11:50 – 12:15 p.m.	Presenter’s Name: William Meissner	Capstone Advisors: -Dr. Chris Bachmann -Mr. Mike Davis	Capstone No.: ISAT-11-12S
Concentration: Biosystems			
Capstone Title: Effective Communication Methods for Relaying Science to the Public			

Capstone Abstract:

Communication within the scientific community can be seen in the consensus and disagreement that is built around hypothesis and experimentation. The problem arises somewhere between the point where a consensus is built by the scientific community and when the general public are informed about the issue. Much of the information that is communicated to the public is channeled through popular media such as large news networks and popular magazines. These news forums can choose to report what is in the best interest of their shareholders rather than the facts. This can lead to the public being fed intentionally false information or not receiving the information at all from time to time. What dictates the public’s understanding and concern for world issues is primarily media coverage. If media coverage of important world issues is sometimes lacking(Romm), or occasionally misleading(Leber), than it will likely dictate a public that thinks it is properly informed but is woefully ignorant of pressing world issues. The general public often fails to seek out information on their own. This study seeks to examine if genuine interest can be increased within the general public by incorporating eye-catching technology alongside scientific debate, to inspire the public to actively seek out truthful knowledge instead of passively absorbing what is presented in the popular press. Several different communication strategies were compared for their ability to educate the public about scientific facts pertinent to renewable energy. Face to face conversations, internet videos, and a public debate were performed in order to examine if using popular technology alongside the presentation of scientific concepts increases viewer’s interest and/or comprehension. The intention of this study is to lay the groundwork for further research on how to effectively communicate scientific information to the general public.



LOCATION: ISAT – ROOM 148

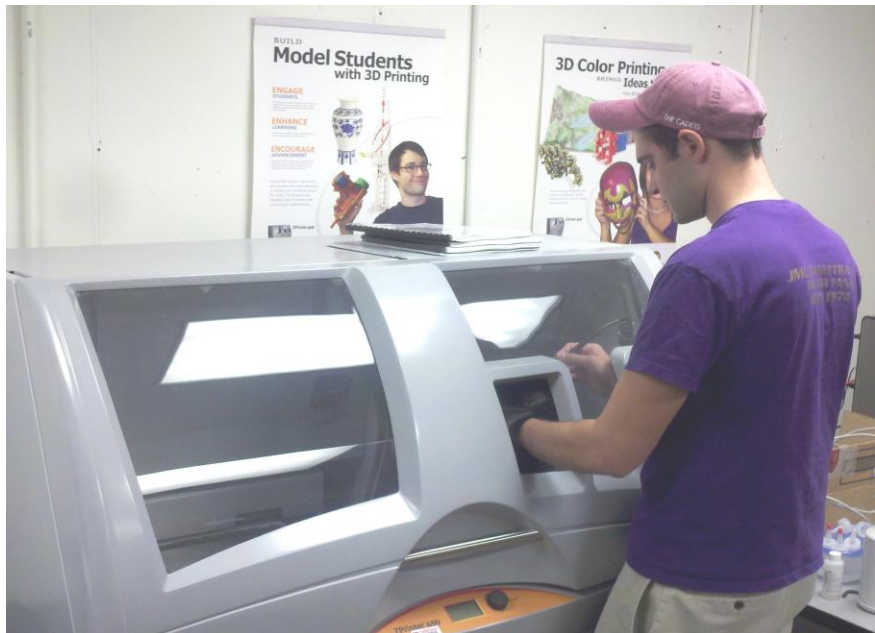
Time: 1:00 – 1:25 p.m.	Presenter’s Name: Michael Phillips	Capstone Advisor: Dr. Abdelrahman Rabie	Capstone No.: ISAT-12-12S
Concentration: Engineering and Manufacturing			
Capstone Title: Design and Testing of Mouthpieces for the Brass Instrument Family			

Capstone Abstract:

The main objective of the project is to investigate the effects of the mouthpieces design and materials on the quality of sound produced by the Brass instruments. CAD system was used to replicate the design of some of the commercially available mouthpieces.

The mouthpieces were made on a 3D printer and

finished using a CVD (Chemical Vapor Deposition). The mouthpieces were tested by students from the JMU School of Music. Quantitative analysis was done on the recorded sounds, using a special software, to break down its harmonic constituents. In addition, a qualitative analysis was done by a survey of several attributes including the comfort and ease of note generation using the different mouthpieces.



LOCATION: ISAT – ROOM 148

Time: 1:30 – 1:55 p.m.	Presenter’s Name: Daniel Ferrante	Capstone Advisor: Mr. Paul Goodall	Capstone No.: ISAT-13-12S
Concentration: Energy, Information Knowledge Management			
External Sponsor: Least of These International			
Capstone Title: Application of Producer Gas Technology in Developing Countries			

Capstone Abstract:

Gasification is a nearly 200 year old technology used to convert solid carbonaceous material into combustible fuel gases. Carbonaceous materials are composed of carbon, oxygen, and hydrogen molecules. Gasification is a four stage process that rearranges these molecules outputting carbon monoxide and hydrogen gases. Both of these fuel gases are clean burning, have high energy content and can



be burned in an internal combustion engine. The shaft work supplied by an engine can then be use to power a generator or water pump. Typical feed stocks consist of coal and biomass. Using biomass as a feedstock, gasification becomes a clean, renewable source of energy where the emissions released during the gasification process are offset by the plant material that is grown to generate more fuel. As such, gasification is an ideal alternative energy solution for rural, off grid regions with the agricultural capacity to sustain biomass feedstock’s. This project studies the practical application of gasification technologies in developing countries as a reliable source of energy by building a down-draft gasifier out of materials likely available in a developing country and evaluating its economics, performance, environmental impact, and operational issues in a rural village setting.

LOCATION: ISAT – ROOM 148

Time: 2:00 – 2:25 p.m.	Presenter’s Name: Andrew Harrison	Capstone Advisor: Mr. Paul Goodall	Capstone No.: ISAT-14-12S
Concentration: Energy, Environment			
External Sponsor: Mr. Chuck DeHart			
Capstone Title: Solar Powered Wood Kiln			

Capstone Abstract:

As the cost of electricity goes up and the need for energy grows, alternative solutions are needed to power the small scale industries that this country is founded on. The craft of making custom guitars takes not only an abundant set of skills and knowledge to complete, but a wide range of different types of wood and methods for preparing them for use. Charles DeHart, a former JMU staff member is planning on building custom handmade guitars at his barn in Fulks Run Va, but in order to do so, he needed to construct a fully operational wood kiln, using only solar energy to power it. Over the course of about one year the project was completed, building the structure suspended on the southern face of his barn/workshop, using only wood, insulation, and clear plastic glazing which allows the sun’s energy to penetrate the kiln but prevents it from leaving. With the addition of a solar powered fan, and some ventilation work, the kiln is not only operational but exceeds the expectations set forth from the onset. This passive wood solar kiln is structurally sufficient, with adjustable ventilation, easy access, and most importantly, it is very effective at trapping the sun’s energy producing heat, which ultimately will be used to dry various kinds of wood used in making custom guitars.



LOCATION: ISAT – ROOM 148

Time: 2:30 – 3:10 p.m.	Presenter’s Names: -Brad Hershey -Brian Scheerer	Capstone Advisor: Mr. Paul Goodall	Capstone No.: ISAT-15-12T
Concentration: Energy, Engineering and Manufacturing			
Capstone Title: Economic and Societal Analysis of Brewers’ Spent Grain Applications			

Capstone Abstract:

The process of making beer is relatively simple, however along with the production of beer comes the production of brewery waste. One main source of brewery waste is the spent grain that is left over after the initial steps in the beer making process. Before the addition of hops, yeast, and other flavor adding substances, malted barley grains are soaked in hot water to establish a base for the beer. After this initial soak, these grains are discarded and no longer needed in the brewing process. Most breweries are faced with a decision about what to do with these “spent grains”. Some breweries donate their grain to local farmers for cattle feed while some simply dispose of it. However, these organic materials present an opportunity for useable energy production. This project investigates options of creating energy from brewers spent grain as well as sustainable uses for all brewery waste. Test results from spent grain samples combined with a review of various recovery technologies will inform investigation of viable options to recycle the material. These options are compared with other possible uses of brewers’ spent grain to describe the most economically, socially and environmentally responsible use of this waste resource.



LOCATION: ISAT – ROOM 148

Time: 3:15 – 3:55 p.m.	Presenter’s Names: -Trevor Hoffman -Randy Ortanez	Capstone Advisor: Mr. Paul Goodall	Capstone No.: ISAT-16-12T
Concentration: Energy			
Capstone Title: Promoting Renewable Energy Through the Music Industry using a Solar-Assisted Amplifier			

Capstone Abstract:

With an ever-rising energy demand across the globe, there is a need to diversify the energy supply portfolio to achieve sustainability. To accomplish this it is imperative to understand how technology and society grow and interconnect as described by the term “technological momentum.” That is, social development shapes and is shaped by technology. A momentum shift towards a more distributed energy generation system will allow the energy market to diversify from the large, centralized powering stations of today leading to a more robust system with greater renewable energy contribution. This study researches the possibility of promoting distributed generation systems through the music industry. Interviews were conducted with music industry personal to discuss the feasibility of altering the energy supply portfolio at concerts. A guitar amplifier and solar charging system were also constructed. The solar assisted amplifier was showcased during a concert to gather the audience’s reaction towards this alternative amplification system. Solar-assisted amplification systems are unusual, but recognizing their potential could be a step closer to renewable energy’s technological momentum.



LOCATION: ISAT – ROOM 148

Time: 4:00 – 4:40 p.m.	Presenter’s Names: -Jonathan Lyons -Timothy Niles	Capstone Advisor: Mr. Paul Goodall	Capstone No.: ISAT-17-12T
Concentration: Energy, Engineering and Manufacturing			
Capstone Title: A Study of Hydrokinetic Ocean Current and Wave Energy Generation			

Capstone Abstract:

Oceans cover more than 70% of our earth and have the potential to supply over 10% of the U.S. energy demand. According to the International Energy Agency, the global ocean current energy resource is estimated to be more than 800 TWh/year alongside the ocean wave energy resource ranging from 8,000 to 80,000 TWh/year. Harvesting the oceans rich energy resource has the potential to make ocean current and wave technologies significant contributors to renewable energy in the near future. This study investigates and assesses the wide range of technological devices that have been conceptualized, designed and tested to capture this abundant energy resource. A Technology Assessment methodology was developed to analyze current and wave technologies for the purpose of identifying leading technology areas and opportunities to



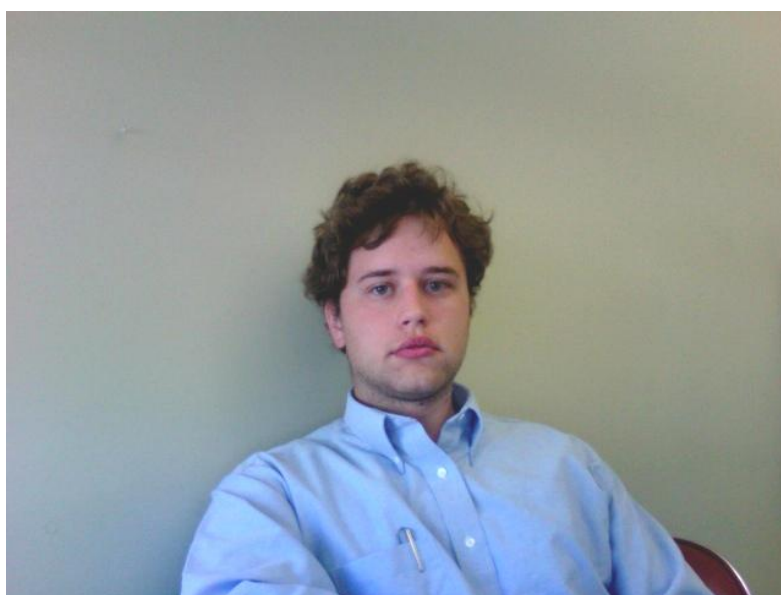
improve the advantageous qualities of these through further research and development. Results of the Technology Assessment indicate few technologies adequate for full-scale power production, signifying great need for improvement to harness the oceans maximum energy resource potential. The study also includes descriptions of leading technologies in the ocean current and wave field and evaluates the capabilities of the JMU Water Tunnel located in the Thermal-Fluids Lab to simulate ocean currents and ocean wave characteristics which will facilitate future tests on small scale prototype designs.

LOCATION: ISAT – ROOM 148

Time: 4:45 – 5:10 p.m.	Presenter’s Name: Andrew Pharr	Capstone Advisor: Mr. Paul Goodall	Capstone No.: ISAT-18-12S
Concentration: Energy			
Capstone Title: Simulation of the Sabatier Reaction to Convert Waste Carbon Dioxide into Usable Energy			

Capstone Abstract:

This presentation reviews a system model for the conversion of carbon dioxide and hydrogen into methane and water via the Sabatier Reaction as modeled on Flowmaster V7™ software. As well as describing mass and energy flows, the system models the electrolysis of water and gives a benefit/cost analysis. This process is modeled for use in a standard 1000 MW coal plant. Flu gas is purified into carbon dioxide and



run through the process. The water produced is recycled back into the system reducing total water consumption by 50% and the surplus oxygen is stored in tanks for sale to offset cost. It was found that although the process works to scale, it was not cost effective given today’s energy demands and cost. However, this technology should still be pursued as energy demand and price will only continue to rise in the future.

LOCATION: ISAT – ROOM 150

Time: 9:00 – 9:40 a.m.	Presenter’s Names: -Alex Haney -Jason Wallace	Capstone Advisor: Dr. Karim Altaï	Capstone No.: ISAT-19-12T
Honors Capstone: Alex Haney			
Concentration: Energy			
Capstone Title: Developing an Affordable, Working Solar Cooker for Third World Nations			

Capstone Abstract:

This project presents a new unique design for a passive solar cooker with an emphasis on sustainability and cooking efficiency, and gives an overview of the technical, social, environmental, and economic implications of solar cooking. Jason Wallace, and Alex Haney worked together to complete this project in three phases: background research, design and build, and sustainability analysis. During the background research phase we researched the current state of the art of solar cooking, looking at the leading designs on the market, and gaining a thorough understanding of the social, economic, technical, and scientific contexts of solar cooking. We also tested the performance of the Tulsi-Hybrid Solar Oven model during the summer months. During the design and build phase we brainstormed and formulated our own unique design based on our working knowledge of the subject and chose a design using an engineering decision matrix to weigh different options. During the final phase we examined the cost analysis of our cooker design and investigated the practicality of presenting our design to the market; either to humanitarian organizations in the third world or to the commercial market here in the United States.



LOCATION: ISAT – ROOM 150

Time: 9:45 – 10:40 a.m.	Presenter’s Names: -Jessica Taylor -Ben Schulze -David Stevens	Capstone Advisor: Dr. Karim Altaii	Capstone No.: ISAT-20-12T
Honors Capstone: Jessica Taylor			
Concentration: Energy			
External Sponsor: Punta Leona Hotel and Club Beach Resort			
Capstone Title: Energy Audit and Renewable Energy Assessment at Punta Leona Hotel and Club Beach Resort, Costa Rica			

Capstone Abstract:

Three JMU students Ben Schulze, David Stevens, and Jessica Taylor traveled to Costa Rica in August and December to complete the first international senior thesis at JMU. They worked at Punta Leona Hotel and Club Beach Resort to perform an extensive Energy audit and analysis. This international collaboration included three students from the University of Costa Rica: Francisco Gamboa, Tattiana Hernandez, and Esteban Saenz. The project consisted of an electricity consumption analysis, thermal imaging and solar site assessments. During their visit they installed electricity monitoring instruments in multiple circuit panels of multiple resort buildings. The instruments collected data, which was accessible in the United States via the Internet. By measuring electricity consumption on a building-by-building and circuit-by-circuit level, detailed electricity information was aggregated. They also used power meters, a thermal imaging camera, and a solar sun path device to collect on-site data during the visit. The power meters were used to measure electricity consumption on a plug-load (or device-by-device) level. Both the remotely-accessed and on-site data gathered at Punta Leona was used to pinpoint critical issues and develop recommendations for Punta Leona management to ultimately reduce their electricity consumption by making the resort more environmentally friendly.



LOCATION: ISAT – ROOM 150

Time: 10:45 - 11:10 a.m.	Presenter's Name: Andrew Augustine	Capstone Advisor: Dr. Jonathan Miles	Capstone No.: ISAT-21-12S
Concentration: Energy			
Capstone Title: A Study of the Testing Capabilities of the Small Wind Training and Testing Facility at JMU			

Capstone Abstract:

The completion of the Small Wind Training and Testing Facility (SWTTF) at JMU will allow students and faculty to engage in hands-on learning in regard to wind energy. The facility will provide the means to advance the wind workforce, to increase community knowledge and engagement, and to test small wind turbines. The testing aspect of the facility will be useful for field-testing new turbine technologies and attracting small wind manufacturers to Virginia aside from the educational benefit. This thesis describes the nature of small wind turbines and testing protocols that are applied across the country, and focuses on determining the capabilities of the SWTTF as a small wind testing site. The deliverables of the project include a testing procedures plan that should be used as a model for future student and faculty efforts in this area. The procedures presented were determined by analyzing practices of regional testing centers and guidance presented within the small wind turbine testing standards developed by the American Wind Energy Association (AWEA) and the International Electrotechnical Commission (IEC).

LOCATION: ISAT – ROOM 150

Time: 11:15 - 11:55 a.m.	Presenter’s Names: -Charles Johnson -Yannick Tamm	Capstone Advisor: Dr. Jonathan Miles	Capstone No.: ISAT-22-12T
Concentration: Energy, Engineering & Manufacturing			
Capstone Title: Tangier Island: A Case Study of the Implementation of Renewables in a Small Island Community			

Capstone Abstract:

The Town of Tangier is a small, remote island near the lower Eastern Shore of the Chesapeake Bay. In 2009, the town was awarded a grant by the Department of Mines, Minerals and Energy (DMME) that was sourced from American Recovery and Reinvestment Act (ARRA) funds for the installation of a wind turbine to supplement the electricity needs of the community. The town of Tangier contracted with Sustainable Energy Developments, Inc. (SED) to site and install a 100-kW turbine on the island. The objective of the authors was to deliver a case study of the development process with an emphasis on exploring the regulatory procedures and challenges, while assisting SED throughout the project. The barriers to wind power on Tangier proved to be insurmountable, thus the project evolved into one that features solar photovoltaics. This thesis presents the final outcome and investigates lessons associated with siting projects of a similar nature.

LOCATION: ISAT – ROOM 150

Time: 1:00 – 1:40 p.m.	Presenter’s Names: -Byron Bundoc -Brent Snyder	Capstone Advisor: Dr. Tony Chen	Capstone No.: ISAT-23-12T
Concentration: Engineering & Manufacturing, Energy			
Capstone Title: Design and Installation of a Small Hydroelectric Power System in Shenandoah Central Valley			

Capstone Abstract:

Hydroelectric power is a technology that lets the human race convert a natural resource into a useable renewable source of energy. There are several different fundamental structures for hydroelectric power plant/generators. These different types of structures are used depending on the situation of the environment in which they are located. Some of the attributes that are looked for in the environment are flow rate, the “head” distance between the water reservoir and bottom where the turbine is, and size of the stream or creek.

This project will go into detail about the new technologies that could provide adequate power efficiency with the least amount of harm done to the environment. The site at which the group will work is about 20 miles north of JMU off Interstate-81 in New Market. It is at an old mill that needs some work to put into in order for a workable area. The stream that provides the mill with water is one of the biggest springs in the Shenandoah Central Valley. The Plain Mills Spring flows roughly 3000 gallons per minute, this water flow at the site is sufficient to produce about 4000 Watts of continuous power. Our main goal is to create a grid tied micro-hydro system that will provide an optimal amount of electrical power to the mill owner’s house and sell the excess power back to the electric company. With the right amount of tools and effort, the group will be able to build a renewable energy system that will not only empower ISAT teaching and research curricula, but also benefit the local community. The system is schedule to be installed in March 2012 and its preliminary performance results will be presented at the ISAT Senior Capstone Project Symposium.

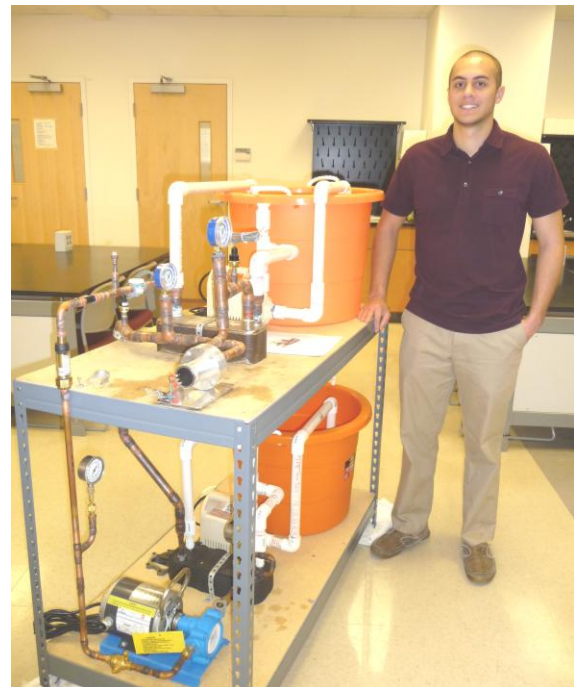


LOCATION: ISAT – ROOM 150

Time: 1:45 – 2:10 p.m.	Presenter’s Name: Zachary Peterson	Capstone Advisor: Dr. Tony Chen	Capstone No.: ISAT-24-12S
Concentration: Energy			
Capstone Title: Design and Test of an Ocean Thermal Energy Conversion Prototype System			

Capstone Abstract:

As the search for sustainable alternative energy sources grows Ocean Thermal Energy Conversion (OTEC) is found as an innovative solution that can help facilitate a shift away from nonrenewable energy sources. OTEC is a technology that harnesses the ocean’s temperature difference from the warm surface zones to the cool bottom levels to drive a heat engine and generate electricity. The purpose of this project was to construct an OTEC prototype system capable of producing 150 watts of electricity. The first step in designing the OTEC prototype was sizing and purchasing components to operate based off the organic Rankine cycle. The components were purchased with money awarded from a research grant provided by the College of Integrated Science and Technology that former project contributor Ross Charland applied for. With the help of James Madison University’s Facilities Management Heating, Ventilation and Cooling group the prototype was constructed. The prototype was tested after construction only to find a leak in the turbocharger. To fix the leak a new turbine, a Tesla turbine, was selected to replace the turbocharger. The modified system is scheduled to be tested in March 2012 and the results will be presented at the ISAT Senior Capstone Project Symposium.



LOCATION: ISAT – ROOM 150

Time: 2:15 – 2:35 p.m.	Presenter’s Names: -Jake Rasmussen -Stephen Tkac	Capstone Advisor: Dr. Maria Papadakis	Capstone No.: ISAT-25-12T
Concentration: Biosystems, Energy			
External Sponsor: Steve Baker			
Capstone Title: Development of A Flat-Plate Solar Thermal Collector for Space Heating of Farm Structures			

Capstone Abstract:

This project evaluates the feasibility and effectiveness of the installation of solar thermal heating panels on farm buildings in the Shenandoah Valley. We will present the technological options available, the pros and cons of these technologies will be described, and a plan of action for implementation will be presented. As many of these farm buildings have large heat loads, these panels would be useful supplementary heat sources if they prove to be cost effective. This project involves the design, build, and installation of a large solar thermal collector in a pig farrowing barn, and also prepared a DIY blueprint for farmers and other consumers to use to create these panels themselves. The efficiencies of the home-made panels will be monitored and compared over the length of the 2012-2013 heating season to determine if the DIY versions can be a cost-effective option for reducing energy costs in farm buildings.

Time: 2:40 – 2:55 p.m.	Presenter’s Name: Robert Frysinger	Capstone Advisor: Dr. Maria Papadakis	Capstone No.: ISAT-26-12S
Concentration: Energy			
Capstone Title: A Comparison of Web-Based Enterprise Energy Monitoring Solutions for Higher Education			

Capstone Abstract:

Enterprise Energy Monitoring (EEM) solutions are tools used by building managers to track and trend energy consumption in their buildings in real-time or on a periodic reporting basis. EEMs generally track a variety of energy consumption types (electricity, water, gas, etc.) and in some cases track sub-components of these consumption types (elevators, computers, compressors, etc.). Institutions implement these solutions in order to better understand their energy consumption, to detect anomalies and to identify opportunities for efficiency improvements. EEMs can also be designed to serve as educational tools for energy consumption stakeholders (building occupants, taxpayers, etc.). This project compares and contrasts a number of EEMs used by universities to evaluate their potential for JMU for teaching, learning, and research on building-scale energy management.

LOCATION: ISAT – ROOM 150

Time: 3:00 – 3:40 p.m.	Presenter's Names: -Warren Grabenstetter -Andrew Knoll -Eric Rothschild	Capstone Advisor: Dr. David Lawrence	Capstone No.: ISAT-27-12T
Honors Capstone : Andrew Knoll			
Concentration: Energy and Environment			
Capstone Title: Earth-Abundant, Environmentally-Benign Materials for Photovoltaics and Solar Hydrogen			

Capstone Abstract:

This senior project involves an experimental investigation of earth-abundant, environmentally benign semiconductor materials that can be applied to solar hydrogen production and photovoltaic (PV) cells. A direct, non-fossil fuel intensive hydrogen source would be an important step toward using reewable energy in the United States. In the solar hydrogen application, the



objective is to use sunlight to split water as directly as possible, producing hydrogen and oxygen. The two materials under investigation are BiVO₄ (bismuth vanadate) and Cu₂ZnSnS₄ (CZTS). Both thin films are deposited on glass substrates using two different techniques. The first is a spray pyrolysis technique in which aqueous solutions of bismuth and vanadium salts are nebulized by an ultrasonic transducer and the resulting mist is transported by a stream of air and directed at the surface. The second is a drop casting technique which involves direct application of the precursor solution to the sample. The film structure is examined with a scanning electron microscope (SEM) and the optical transmission is measured as a function of wavelength with a UV/visible spectrometer. The BiVO₄ films are deposited from various precursor solutions and films have been prepared doped with molybdenum, tungsten, and calcium. The performance of the films in splitting water is tested in a photoelectrochemical (PEC) cell. For this measurement, an electrical connection is made to the semiconductor material and it is immersed in an aqueous solution. A platinum screen is used as a counter electrode and the current that flows between these electrodes is measured when light from a solar simulator (AM1.5G) shines on the test sample. The CZTS photovoltaic test samples will be measured for their efficiency converting solar energy into electricity in order to be compared with other thin film photovoltaics.

LOCATION: ISAT – ROOM 150

Time: 3:45 – 4:10 p.m.	Presenter’s Name: Christopher Keys	Capstone Advisor: Dr. Wayne Teel	Capstone No.: ISAT-29-12S
Concentration: Environment			
Capstone Title: Biochar as a Growing Amendment			

Capstone Abstract:

The objective of this project was to determine which agricultural amendment in combination with biochar or individually, leads to the largest crop yield by mass for a Hybrid Cabbage (*Brassica oleracea*). Biochar is charred (pyrolyzed) organic matter and is effective as a soil amendment, good for soil drainage, its cation exchange capacity (ability to store nutrients in the soil) and storing carbon in the earth. The agricultural amendments used for the study were

biochar, compost and manure at five ten and fifteen percent concentrations of the control soil by volume. Fertilizer was also tested along with biochar in combination with the other three soil amendments. This pot study was done with each soil amendment combination in three replications in green house conditions from September 16, 2011 until February 29, 2012. The effectiveness of each amendment was determined by the cabbage head mass and the cabbage dry root mass. In previous pot studies biochar was shown as an affective soil amendment over control soils and especially when growing plants in nutrient poor soils. Our study has shown that the 5% biochar compost mix yielded the greatest average cabbage mass of all the combinations tested.



LOCATION: ISAT – ROOM 150

Time: 4:15 – 5:00 p.m.	Presenter’s Names: -Julianne Decker -Amanda Martindale -Marlee Najamy-Winnick -Dorottya Spolarics	Capstone Advisor: Dr. Wayne Teel	Capstone No.: ISAT-28-12T
Concentration: Environment			
External Sponsor: 25 x 25 and ISAT			
Capstone Title: Construction and Implementation of a Pyrolysis Unit for the Production of Biochar in a Sustainable Greenhouse Heating System			

Capstone Abstract:

Biochar is a form of charcoal used as an agricultural amendment. The process of making it involves pyrolysis, the burning of biomass in the absence of oxygen resulting in a carbon rich, high surface area product. The main byproduct of the pyrolysis process is excess heat that is often unused and released into the atmosphere. The primary purpose of our project was to build an efficient pyrolysis unit and capture the excess heat. This heat energy was then incorporated into an existing system at Avalon Acres Farm in Broadway, Virginia as a backup method for heating a greenhouse.



The original heating system was powered solely by solar thermal collectors, which are ineffective during cloudy periods. The overall effect of integrating the two units was a sustainable system that provides back up heat on days when the sun is not able to serve as the primary heating source. Phase I of the project involved constructing the pyrolysis unit and connecting it via plumbing to the original system. Phase II consisted of taking temperature data through various burns while creating biochar for farm use and characterization. The biochar created during the burns was combined with compost and applied to the gardens as a soil amendment. In Phase III the different charred materials such as cedar, sycamore, mulberry, local algae, and chicken, horse and sheep manure were characterized in the laboratory to determine and compare their properties. The system was successfully built and integrated and approximately 23,700 kcal of heat energy was effectively transferred to the greenhouse per burn. The main design recommendation from this project is to improve air flow to increase combustion efficiency in the system, reducing smoke.

LOCATION: ISAT – ROOM 337

Time: 9:00 – 9:40 a.m.	Presenter’s Names: -Jason Farber -Adam Mass	Capstone Advisor: Dr. Morgan Benton	Capstone No.: ISAT-30-12T
Concentration: Information Knowledge Management			
External Sponsor: Tony Britt			
Capstone Title: Spotter Charts			

Capstone Abstract:

In the Spring of 2011, an ESPN statistician for college football approached JMU ISAT with a project – to fully automate production of “spotter charts,” a valuable resource of player and team information available to college football announcers during live broadcasts. Students, Jason Farber and Adam Maas, led by Professor Morgan Benton took the project on. The team’s goals sought a method to minimize “spotter chart”



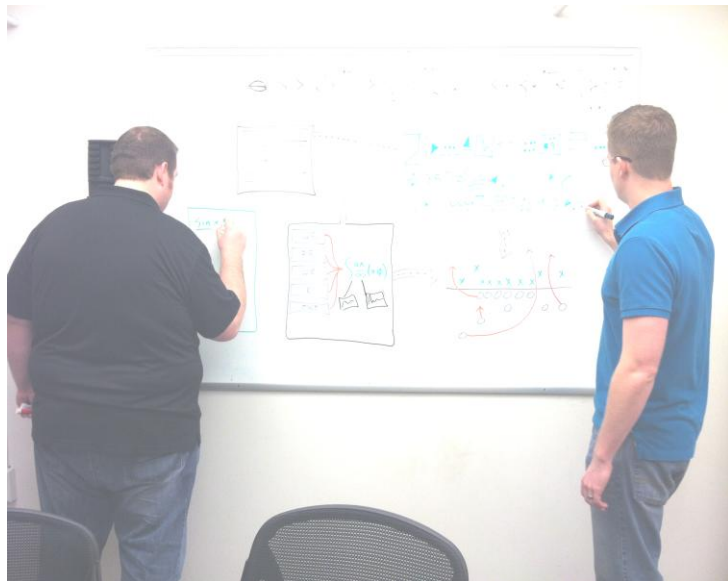
production time from the previous eight hour manual process. While minimizing time, the team had to maintain accuracy, high quality and flexibility of the presentation of more than 2,000 data points per chart. After understanding the goals, there were many outstanding challenges. Understanding the original production process, finding reliable data sources, recreating the intricate style, formatting the chart, and adapting automation efforts to meet weekly deadlines all added to the complexity of the project. After many hours of development and hard work, the team produced superb results. They showed increased chart production by 60 percent and gross revenue by 30 percent. The product developed has also helped secure new ABC/ESPN announcers for the 2012 season. This long term project hopes to expand its efforts to capture the majority of the large college football announcing market both regionally and nationally.

LOCATION: ISAT – ROOM 337

Time: 9:45 – 10:25 a.m.	Presenter’s Names: -Mark Morris -Shaun Watson	Capstone Advisor: Dr. Morgan Benton	Capstone No.: ISAT-31-12T
Concentration: Information Knowledge Management			
External Sponsor: Dynasty Sports, LLC			
Capstone Title: Fantasy Football Database & Website Application with Projection System Integration (PROJECT JACOBUS)			

Capstone Abstract:

This purpose of this project was to take fantasy football data and manipulate the data to show key statistics for specific teams within a respective league, statistical data that isn’t currently tracked today by any fantasy football application. Data was taken from performance of an actual fantasy league and configured to show the points per week from each roster spot on the team roster and the ranking of that team in that particular category in respect to the rest of the league. Having this data presented to each team manager had effects on decisions made as a result of that team’s ranking of a roster position in the league.



As a result, a detailed analysis was performed on the decisions made by a team manager in this league regarding roster changes and trades and the effects of such decisions, in regard to whether performance of the team overall was improved or diminished. Additionally, a new algorithm was developed to guide the projection system of the site to allow improved accuracy for the projections of QB player performance each week over current fantasy football sites that exist today. Historical data was analyzed for each QB per game and data regarding the defense of the team the QB was opposing was also used in developing this algorithm. This algorithm was plotted against all historical data to determine the overall accuracy and to justify the legitimacy of using this algorithm for future data projections. As a result, data projections for the upcoming 2012 season were made and presented for each starting QB in the NFL. Lastly, a website was built that implements all of these features and displays results of all research performed in support of this project.

LOCATION: ISAT – ROOM 337

Time: 10:30 – 11:10 a.m.	Presenter's Names: -Brian Ford -Christopher Gogoel	Capstone Advisor: Dr. Morgan Benton	Capstone No.: ISAT-32-12T
Concentration: Energy, Information Knowledge Management			
Capstone Title: ISAT IPA – Integrated Portfolio Assessment			

Capstone Abstract:

ISAT has 11 goals at the program level for its graduates that are labeled A-K. Under each goal is between 4-11 objectives. In order to maintain accreditation with Accreditation Board for Engineering and Technology (ABET) it is necessary to demonstrate with evidence that we are achieving these goals and objectives. Many of the objectives can be assessed quantitatively with objective measures such as the Force Concept Inventory. However, many of the objectives have no straight forward means by which they can be assessed. This makes it difficult to say with certainty that the ISAT program is indeed achieving its goals and objectives. In order to address this problem the ISAT Assessment Committee decided to embark on a project in which they would systematically collect representative samples of ISAT student work from across all four years of their time in the program. These artifacts would then be judged qualitatively using specially-designed rubrics by ISAT faculty members each year to determine if the goals are being reached. As the collection, organization, and evaluation of the student work is extremely labor-intensive process, a software solution was proposed. This project purports to write a web-based software system that would enable the ISAT Assessment Committee to achieve their aim of valid and systematic assessment of all of the ISAT goals and objectives.

LOCATION: ISAT – ROOM 337

Time: 11:15 – 11:55 a.m.	Presenter’s Names: -Matthew Hurd -Alex Mastro -Michael Sliwinski	Capstone Advisor: Dr. Morgan Benton	Capstone No.: ISAT-33-12T
Concentration: Engineering and Manufacturing, Information Knowledge Management			
Capstone Title: U Matter2Us			

Capstone Abstract:

Modern educational practices are standardized, lack validity and do not promote learning on an individual basis. Professors need a way to determine what a student already knows, wants and needs to know, while monitoring progress and encouraging development. This project proposes the solution as a Wordpress plugin, called U Matter2US, that will create an online learning environment where members form a community. This plugin is designed to promote peer-supported learning among student participants. U Matter2US will remove the standard structure of in-class lectures and allow students to learn what they want, at their own pace, following the guidelines of their professor. By demonstrating their mastery of an objective, students will display knowledge learned in a course and not be under the constraints of standardized tests and grading practices. This insures that the information learned is retained and useful outside of the classroom. It also promotes the learning techniques of each individual, as opposed to the prevalent behavior of cramming for an exam where knowledge is regurgitated and not retained. Students and professors will create and adopt objectives, form groups, provide feedback and demonstrate mastery of objectives through their work. Professors will be able to monitor the class by interacting with several modules and widgets that monitor progress of each student, as well as the class as a whole. These widgets will allow the professor to provide support where it is needed most and be more available to students. This plugin will also require that professors learn from their students and will improve their abilities to evaluate themselves as educators. Students will relate to professors on opinions and objectives because teachers will be learning alongside their students. These features will make U Matter2Us a valuable tool for teaching and supporting a learning community.



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LOCATION: ISAT – ROOM 337

Time: 1:00 – 1:40 p.m.	Presenter’s Names: -Patrick Knowlan -Mark Ostrander	Capstone Advisor: Dr. Anthony Teate	Capstone No.: ISAT-34-12T
Concentration: Information Knowledge Management, Telecommunications			
Capstone Title: Campus Integration of Android Mobile Application			

Capstone Abstract:

The purpose of this project is to develop an Android mobile application that allows students and faculty to access university information through a single mobile resource. Current university information is dispersed among online web pages, physical documents, and social media, making it difficult



for the James Madison community to access information on the go such as professor email, phone/office number, university news, and events. Mobile devices have become increasingly popular among students, faculty, and staff at James Madison University. The introduction of a social and academic Android application will allow community members to seamlessly have access to online resources quickly and effectively. The front end of CampusAssistant is a mobile application built on the Android software stack. This application was developed in Eclipse that utilizes the Java framework. The back end contains a SQL database, which stores and passes content between client devices and the host server using PHP. With the implementation of a campus mobile application students would be granted access to necessary academic and social components of attending a university through one simple, user-friendly interface. CampusAssistant allows users to access information about JMU’s people, places, news, and events without having to perform multiple online searches. CampusAssistant is designed to increase student/faculty communication, university awareness, and boost academic, club, and social events. CampusAssistant will help new students and visitors explore and learn about the JMU campus through maps. It is a powerful mobile tool for everyday campus life, better connecting users to the JMU community.

LOCATION: ISAT – ROOM 337

Time: 1:45 – 2:10 p.m.	Presenter’s Name: Christopher Jackson	Capstone Advisor: Dr. Anthony Teate	Capstone No.: ISAT-35-12S
Concentration: Information Knowledge Management			
Capstone Title: Mobile Wireless Measurement			

Capstone Abstract:

Mobile computing devices, such as smartphones and tablets, have become common-place fixtures in our world. Due to the extremely portable and connected nature of smart phones and tablets, these make ideal data collection devices for capturing data from sensors deployed in the field. Unfortunately at present time there is a shortage of sensors that can connect to mobile computing devices for data collection. The goal of this project was to begin



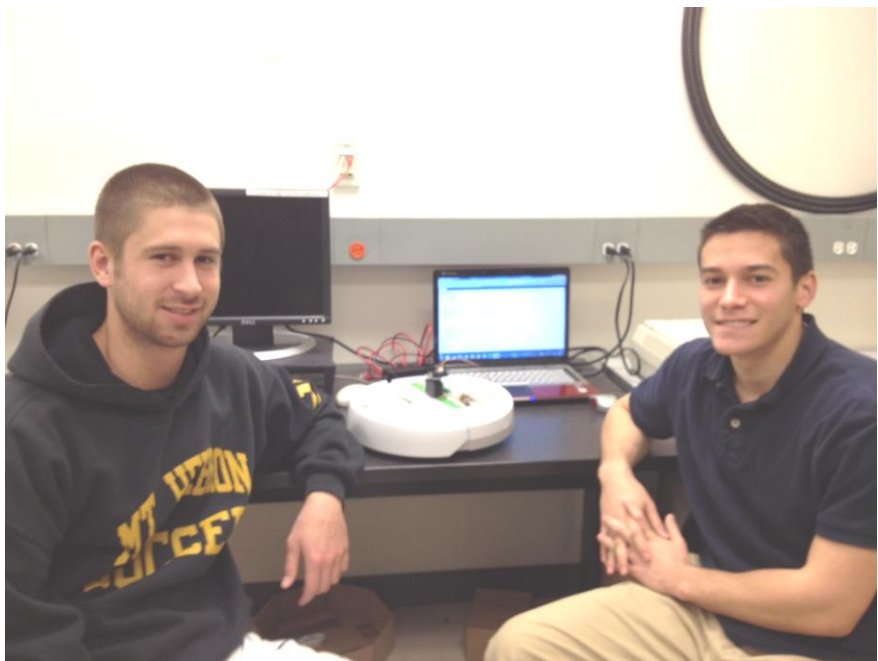
the process of developing sensor devices that can communicate with smartphones and tablets wirelessly to collect various types of data. The Bluegiga line of FCC qualified Bluetooth 4.0 modules provided a stable development platform for the wireless sensors. Sensor firmware was written using Bluegiga's proprietary BGScript language. In hopes that this project can continue to grow, a website was developed to foster open-source continuation of the project.

LOCATION: ISAT – ROOM 337

Time: 2:15 – 2:55 p.m.	Presenter's Names: -Ryan Cangelosi -Joseph Meyler	Capstone Advisor: Dr. Anthony Teate	Capstone No.: ISAT-36-12T
Concentration: Information Knowledge Management			
Capstone Title: iRobot Create Autonomous Behavior Development			

Capstone Abstract:

Autonomous robots are becoming an increasingly researched technology as we see them ever more prevalent in today's world. This growing trend is what led us to explore the world of robotics and how they can be implemented with a variety of sensors in order to adjust functionality. This project uses the iRobot Create® development platform, which is a programmable robot similar to the Roomba®,



however without any of the vacuum cleaning capabilities. Instead, the Create platform allows for additional hardware and software to be added. For this project, an infrared range finder sensor was attached to the Create which enabled it to follow and track an object in motion. Using this foundation, this project is exploring the use of implementing RFID technology with the iRobot Create®. An RFID reader will be interfaced to the Create which then enabled it to roam around autonomously by using feedback from strategically placed RFID tags. The digitally encoded information received from the RFID tags will be interpreted by the Create robot in order for it to determine from its programming how to respond. We hope that this project will encourage future students to engage in autonomous robotic programming and behavior in ways that will benefit the ISAT program.

LOCATION: ISAT – ROOM 337

Time: 3:00 – 3:40 p.m.	Presenter’s Names: -Sarah Abouzied -David Grayson -Sarah Osorio	Capstone Advisor: Dr. Anthony Teate	Capstone No.: ISAT-37-12T
Concentration: Information Knowledge Management			
Capstone Title: Engaging Students in Science through Mobile Application Based Science Experiments			

Capstone Abstract:

The purpose of this project is to develop Android-OS based software code modules that will be used as the core components of a series of smartphone mobile applications that can be used for laboratory experiments in college courses. These plug-in code components will be developed into full laboratory experiments that can be used in an introductory science course such as Analytical Method 152-- Topics in Applied Science. Each code module will take advantage of internal sensors in Android



based smart phones and tied to a concept or concepts studied in these introductory courses. For example, when students study centripetal forces and centripetal acceleration during lectures, the lab will involve them downloading an app to their smartphones before coming to the laboratory classroom. That downloaded app + smartphone will become a data acquisition and analysis tool. By using the internal 3 axis accelerometer of the phone and a well designed experiment, along with code developed in the app, the student will be able to measure variables such as the speed, centripetal acceleration and acceleration of gravity. We believe that by actively engaging the student before, during and after the experiment through a device that many of have come to view as essential to their everyday lives will encourage more students to consider STEM as a career choice. We hope develop smartphone app-driven laboratory experiments centered on the internal temperature, light and proximity sensors. We will also begin to develop smartphone apps that can interface to devices like Bluetooth technology that will permit control of such devices as our iRobot Create®. Finally, all code developed for these devices will become part of an ISAT code repository for future development and enhancements.

LOCATION: ISAT – ROOM 337

Time: 3:45 – 4:25 p.m.	Presenter’s Names: -Andy Duong -Blake Jenkins -Nick Kershl -Sean McMillin -Jan Smith -John Turner	Capstone Advisor: Dr. Nicole Radziwill	Capstone No.: ISAT-38-12T
Concentration: Information Knowledge Management, Engineering and Manufacturing			
External Sponsor: Starr Hill Brewing Company			
Capstone Title: Exploratory Analysis of 2010 Starr Hill Brewing Company Production Data			

Capstone Abstract:

Starr Hill Brewery, located in Crozet, VA, has increased their production over the last couple years and their products have become much more ubiquitous in the regional market. While Starr Hill continues to record measurements from every batch by hand on a datasheet, no in-process or retrospective statistical analysis is done on the data from the batches to ensure quality. The



DMAIC (Define, Measure, Analyze, Improve, Control) process improvement methodology was applied to data from the year 2010 from six Starr Hill product lines to accomplish four primary goals: 1) develop suggestions for improving production efficiency; 2) reduce loss during the brewing process; 3) improve data consistency; and 4) improve product quality control. Several statistical techniques and intelligent systems algorithms were explored.

LOCATION: ISAT – ROOM 337

Time: 4:30 – 4:55 p.m.	Presenter’s Name: Nana Darko	Capstone Advisor: Dr. Emil Salib	Capstone No.: ISAT-39-12S
Concentration: Information Knowledge Management, Telecommunications			
Capstone Title: Undergraduate Hands-On Senior Capstone Project on Emerging Mobile IPv6 Technology			

Capstone Abstract:

The turn of the 21st century has brought about a growing concern in the Networking field, namely the issue of IPv4’s limited capability to adapt to the growing demands of IP addresses. With the exhaustion of IPv4 addresses now a reality, Internet Protocol version 6 (IPv6) is now in a transition state to replace its predecessor. The emergence of mobile devices such as Smartphones, GPS systems, and new car systems supporting IP capabilities has brought about a dilemma in the Telecommunications industry, and IPv6 can be the answer. To address this issue, the main goal of the project is to emulate a seamless mobility experience by exploring the mobile capabilities of the emerging IPv6 technology. To accomplish this goal, first we had to delve into the specifics of IPv6, a topic not typically covered at the undergraduate level at this time. Second, we designed and are in the process of constructing a Mobile IPv6 prototype that allows users to hold seamless Voice over IP (VoIP) conversations or data exchanges via smart devices while roaming from their home IP network to a foreign IP network. Furthermore, to overcome resource limitations, the prototype makes use of Open Source platforms, such as Linux and Virtual Networking Tools such as VMware Workstation that facilitates the creation and management of virtual machines and GNS3 which enables users to incorporate virtual routers and switches in their emulated virtual networks. This prototype will also allow us to demonstrate and verify the benefits of Mobile IPv6 such as neighbor discovery, address auto-configurations and the built-in IPsec security tools.

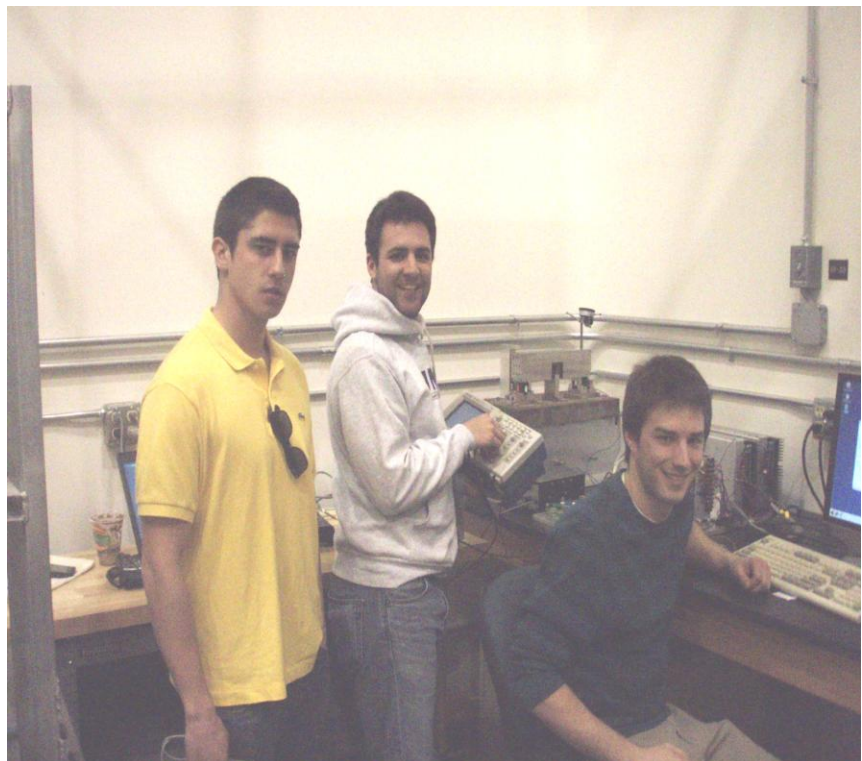


LOCATION: ISAT – ROOM 350

Time: 10:00 – 10:40 a.m.	Presenter’s Names: -Michael Coleman -Eric Daley -Michael Hill	Capstone Advisor: Dr. Eric Maslen	Capstone No.: ISAT-40-12T
Concentration: Instrumentation and Measurement			
Capstone Title: A Rocking Beam Magnetic Bearing Test Platform			

Capstone Abstract:

Magnetic bearings are complex systems that integrate numerous composite technologies into their operation, including magnets, electronics, control algorithm, and real-time processing, in order to produce a product that is engineered to meet specific economic and industrial considerations. This project involved the recommissioning of a pre-existing magnetically controlled apparatus so that it may play a role in the ISAT curriculum, with focus on instrumentation and measurement. The apparatus consists of a rocking beam centered on a singular pivot point, with opposing magnets at both ends. Its position is measured by an eddy current sensor, which delivers position data to a real time processor. This processor possesses the proper control algorithms to magnetically stabilize the beam and reject applied loads. The algorithms can be accessed through a user interface, which allows the user to manipulate its parameters and easily observe the response of the beam. This apparatus will compliment current ISAT classes, as well as provide a base for future student projects.



LOCATION: ISAT – ROOM 350

Time: 10:45 – 11:10 a.m.	Presenter’s Name: Kettie Holland	Capstone Advisor: Dr. James Barnes	Capstone No.: ISAT-41-12S
Honors Capstone: Kettie Holland			
Concentration: Environment			
Capstone Title: Pedestrian-Transit Only Campus Concept			

Capstone Abstract:

The purpose of the Pedestrian-Transit-Only Campus Concept is to present a designed approach to explore the impact that closing the JMU campus to vehicular traffic, with the exception of emergency, maintenance, delivery vehicles, and bicycles would have on the JMU, Harrisonburg, and the Rockingham County community. Closing off the campus to individual vehicles can solve a number of current problems facing the university. In order for the university to be a pioneer of environmental stewardship, JMU needs to reduce its carbon footprint. By embracing alternative transportation systems such as buses, walking, bikes, etc. the amount of harmful air pollutants emitted as a direct effect of driving could be eradicated. Utilizing mass transit is also economically feasible for students, faculty, and staff. By improving the current bus system and implementing new technology, parking passes and associated tickets will no longer be necessary. Dangers associated with traffic congestion will also decrease, alleviating traffic congestion surrounding the campus and allowing easier access for emergency vehicles. Through designing this project I did an extensive review on previous transportation studies and conducted a survey of my own on transportation methods and opinions at the university. In the blinded study I found that students are in support of JMU’s goals for environmental stewardship and would be in support of riding the bus if there were technologies that would alert them about the arrival of the bus. In a similar survey for the administrators, faculty, and staff the majority of responders strongly supported JMU’s goals for environmental stewardship and 56% responded that they support JMU becoming a pedestrian-transit only campus. Through implementing new technologies and improving the current bus system, a Pedestrian-Transit-Only Campus Concept could greatly benefit JMU.



LOCATION: ISAT – ROOM 350

Time: 11:15 – 11:55 a.m.	Presenter’s Names: -Sean Hallett -James Schavel, Jr.	Capstone Advisor: Dr. George Baker	Capstone No.: ISAT-52-12T
Honors Capstone: Sean Hallett			
Concentration: Environment			
Capstone Title: Managing Power Factor to Maximize Efficiency of Shenandoah Valley Electric Cooperative's Electrical Power Distribution System			

Capstone Abstract:

It is imperative to make certain that our national grid is operating as efficiently as possible to ensure a sustainable energy future for ourselves and generations preceding. Natural resources are too precious to be wasteful and careless with our consumption and use. One way to make the grid and subsequent power distribution systems operate more efficiently and effectively is to closely monitor the “power factor” on the grid. The power factor is a measure of the amount of energy being lost due to reactive power. Reactive power, also referred to as “wattless power” due to its inability to perform work, is the power lost in the creation of electric and magnetic fields due to the reactance of certain equipment, most notably rotating machinery. Industrial plants are prime creators of reactive power. Reactive power losses can be compensated with the proper placement and sizing of capacitors and regulators on the electric power grid. In cooperation with Shenandoah Valley Electric Cooperative (SVEC), this project involved analyzing reactive power losses, installing a corrective capacitor device, and assessing its power factor improvement on the SVEC power distribution system (PDS) West Winchester substation, specifically the Fox Drive feeder that supplies power to industrial plants in the Winchester, VA area. Following device installation, we determined that the corrective capacitor bank was effective in reducing the reactive power generated at the plants, thus improving the local power factor by approximately 2.0 %. This effort and others like it provide many benefits to the grid, suppliers, and consumers alike such as: a lower overall current, reducing carbon emission, conserving fuels and thus reducing reliance on foreign oil, increasing system reliability, and reducing grid congestion. The merit of developing an improved understanding of the impacts of reactive power, pursuing corrective actions, and developing new technologies able to monitor and assist with reducing reactive power losses across the nation’s grid is clear.



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LOCATION: ISAT – ROOM 350

Time: 1:00 – 1:25 p.m.	Presenter’s Name: David Keeling	Capstone Advisor: Dr. Thomas Benzing	Capstone No.: ISAT-42-12S
Concentration: Environment			
External Sponsor: White House Farm Foundation			
Capstone Title: An Initial Survey of the Environmental Conditions at White House Farm on the Shenandoah River in Page County, Virginia			

Capstone Abstract:

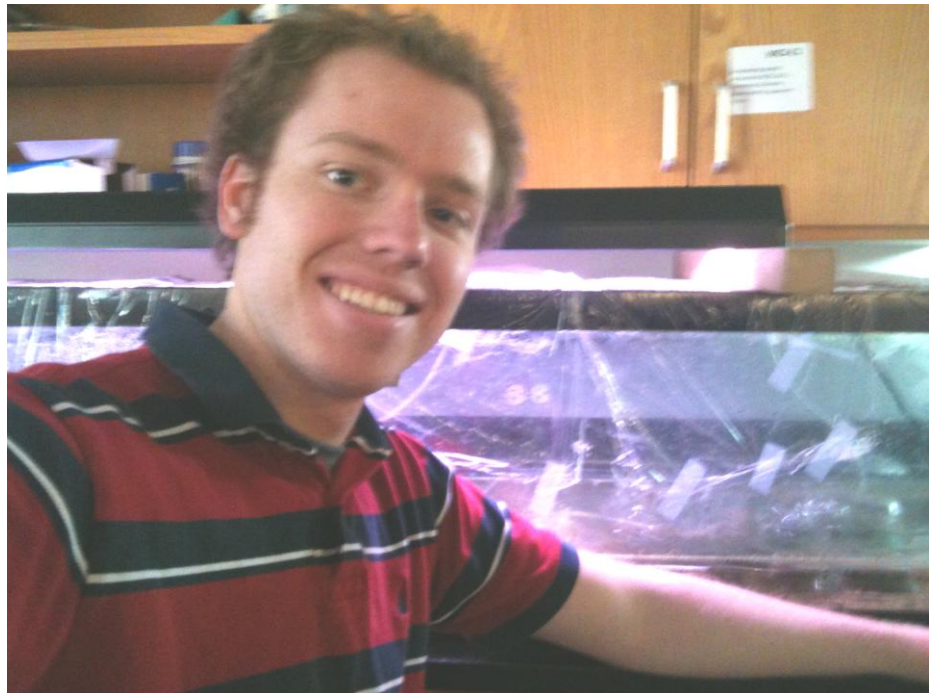
The objectives of this project were to obtain baseline environmental data for the South Fork of the Shenandoah River at the White House Farm location in Page County, Virginia. The White House Farm Foundation is a non-profit educational foundation whose goals are to promote environmental stewardship. River water temperatures were taken from July to September 2011 using programmable temperature sensors. These temperature data showed an association of lower water temperatures with high river flow events as measured at the USGS gaging station. A second temperature study was also conducted using a temperature probe to locate any springs that may be entering the river channel. No springs were located. We also conducted a mercury study on three species of fish; smallmouth bass, redbreast sunfish, and northern hogsucker. Total mercury levels in smallmouth bass were 1.42 mg/kg, which is significantly higher than the health advisory on fish consumption. This result is consistent with historic data collected by the Virginia Department of Environmental Quality.

LOCATION: ISAT – ROOM 350

Time: 1:30 – 1:55 p.m.	Presenter’s Name: Alex Proffitt	Capstone Advisor: Dr. Robert Brent	Capstone No.: ISAT-43-12S
Concentration: Biosystems			
Capstone Title: The Reuptake of Nutrients from Wastewater by Green Algae			

Capstone Abstract:

The current procedure for treating residential wastewater is safe and effective, but it is far from perfect. To improve sanitation and conserve resources, natural means of wastewater treatment have been adopted in wastewater treatment plants throughout the U.S. An innovative post-procedural method of wastewater treatment that has grown in popularity is



the use of algae to further break apart the nitrogen, phosphorus, and other nutrients in wastewater. This process is used as a tertiary form of treatment after the water has been through the primary and secondary processes in wastewater treatment plants. Algae are simple, aquatic plant forms that are found commonly in nature and easy to grow and nourish. Algae grow by feeding on waterborne nutrients that pollute rivers and streams, in this case residential wastewater, and therefore, help to purify the water. The algae in this experiment were green algae, a highly diverse group commonly found in freshwater environments. The effectiveness of these algae at purifying wastewater was studied by inserting the colonies into wastewater inside aquariums similar to high rate algal ponds. Sun lamps and air pumps operated to give the algae the nourishment it needed and the aquariums were sealed to prevent any airborne contamination. Algal mass and nutrient content were measured to monitor the growth of algae and reduction of nutrients. Nitrogen was measured using ion chromatography, and total phosphorus was measured using an ascorbic acid spectrophotometric method. Included in the results are also recommendations on the extent to which algal treatment of residential wastewater can be implemented.

LOCATION: ISAT – ROOM 350

Time: 2:00 – 2:40 p.m.	Presenter’s Names: -Arthur Berberich, II -Spencer Davis	Capstone Advisor: Dr. Robert Brent	Capstone No.: ISAT-44-12T
Concentration: Energy, Environment			
External Sponsor: DuPont Corporate Remediation Group			
Capstone Title: How Do Wastewater Treatment Plant Upgrades Aimed at Reducing Chesapeake Bay Nutrients Impact Local Water Quality and Mercury Cycling in the South River?			

Capstone Abstract:

Nutrients such as phosphorus and nitrogen are necessary in supporting natural ecological functions within a river system. Excess nutrients loaded into a watershed can cause algal blooms subsequently depleting the oxygen supply necessary for aquatic life. This problem is seen throughout the Chesapeake Bay watershed and ultimately is one of the sources of impairment in the Chesapeake Bay. This problem was addressed in 2008 when the Commonwealth of Virginia instituted regulations to reduce nutrients discharged into surrounding watersheds from point sources. To meet these new requirements the municipal wastewater treatment plant in Waynesboro, Virginia implemented approximately \$33 million in renovations with the transition of a trickling filter to a 5-stage biological nutrient removal process and the addition of UV disinfection. The purpose of this investigation was to evaluate the effects of these upgrades on algal biomass and mercury uptake in the South River. The interest in mercury uptake stems from the fact that over 130 miles of river downstream from Waynesboro is contaminated with elevated mercury levels. Inorganic mercury is methylated within the river system and then enters the food chain through uptake by periphyton. This study investigated whether these mercury dynamics were impacted by reductions in nutrients from the wastewater treatment plant. Periphyton, algal biomass, nutrient levels, water quality parameters, and total and methyl mercury were measured at five locations over a six-week duration before, after and one year after the wastewater treatment plant upgrades were completed. The additional fifth site was added in the one-year post investigation. The study showed that the upgraded treatment greatly reduced nutrient levels in the South River, and the rate of mercury uptake appears to have decreased in relation to an upstream reference.



LOCATION: ISAT – ROOM 350

Time: 2:45 – 3:25 p.m.	Presenter’s Names: -Brendan Moran -John Samaha	Capstone Advisor: Dr. Robert Brent	Capstone No.: ISAT-45-12T
Concentration: Environment			
Capstone Title: Investigating Environmental & Social Issues within the Managua City Dump			

Capstone Abstract:

This project investigated the environmental and social issues within the Managua City Dump, La Chureca, in Nicaragua. The fact that there exists a permanent population living within the dump brings about many human health concerns in addition to related environmental concerns. Multiple options have been modeled and analyzed in an effort to improve human health and halt local environmental degradation. One option is to construct a modern incinerator in order to dispose of the waste cleanly, while providing power to the city of Managua. Another option is to create a more sophisticated landfill within the dump to improve the environment and health issues affecting the people who reside there. The last option is implementing a recycling facility which will not only help the environment by reusing bottles, cans, glass, etc., but employ people living within the dump who search through the trash for money each day. After performing a cost analysis on the three proposals, it was evident that the most feasible course of action would be to establish a symbiotic setup consisting of both a recycling facility and landfill. This would allow for reuse of materials coming into the site, while still providing a place for those items that are not recyclable. The goal of this project is to make the public aware of this situation in Nicaragua and be able to educate them by demonstrating that the environment and society are directly related.



LOCATION: ISAT – ROOM 350

Time: 3:30 – 3:55 p.m.	Presenter’s Name: Matthew Penning	Capstone Advisor: Dr. Robert Brent	Capstone No.: ISAT-46-12S
Concentration: Environment			
Capstone Title: Water Quality Assessment: Quantifying the Effect of Purcell Park Restoration Work on the Sediment and Nutrient Loads of Blacks Run			

Capstone Abstract:

In 1996, Blacks Run was added to the Clean Water Act’s 303(d) impaired waters list for violation of fecal coliform and benthic aquatic life water quality standards. To improve stream health in Blacks Run, a restoration project in Purcell Park was undertaken in March 2009. This project implemented a number of measures to improve stream health: the stream channel and banks were reshaped, log and rock structures were added, and trees and live stakes were planted in the upland area and along the stream banks. This thesis project supported the post-restoration monitoring effort by providing a comprehensive water quality profile of Blacks Run. The goal of this profile was to quantify the effect the restoration had on the nutrient content and sediment load of Blacks Run. The study featured data collection from three Blacks Run sites (one upstream in an urban setting, one in Purcell Park, and one downstream in a rural setting) and one on Seibert Creek in Purcell Park. The following data were used to characterize the post-restoration condition: nutrient analysis of water samples, water quality parameters, macroinvertebrate counts, relative bed stability (RBS) assessments, and a map of bare soil in the riparian zone. Specific results that demonstrated improvement in Blacks Run included the RBS assessment, nutrient analysis, dissolved oxygen, and pH. The RBS assessment for the Purcell Park and downstream sites indicated that the stream channel was stable, while both sites on average contained less total nitrates and phosphorus than the urban upstream site. Dissolved oxygen and pH both improved as Blacks Run coursed through Purcell Park and downstream, but temperature, specific conductivity, and turbidity were highest within the Park. Overall, several parameters illustrated water quality improvements, however, macroinvertebrate assessments indicated that all of the Blacks Run sites still exhibited unacceptable ecological conditions.



LOCATION: ISAT – ROOM 350

Time: 4:00 – 4:40 p.m.	Presenter’s Names: -Ryan Cook -Michael Hamill	Capstone Advisor: Dr. Robert Brent	Capstone No.: ISAT-47-12T
Concentration: Energy, Environment			
External Sponsor: United States Geological Survey			
Capstone Title: Ozonification of Mine Wastewater for Metal Removal			

Capstone Abstract:

Acid mine drainage is a prevalent problem in states containing large surface mining operations. Runoff and leachate from mining sites exhibit low pH (<5), which solubilizes naturally occurring heavy metals within the rock. The characteristic low pH and high metal concentrations of acid mine drainage can degrade local ecosystems and impact human health. In this study, a patented USGS process for treating acid mine drainage was used to remove dissolved metals from solution in a continuous flow reactor. The process uses ozone to raise the oxidation reduction potential (ORP) of the water and precipitate dissolved metals such as iron and manganese. The effluent from the system was sampled and filtered through various pore sizes to determine the size of precipitated particles and the percentage of metals removed by the process. Standard curves were then created to gauge the efficiency of the system’s removal capabilities for varying concentrations of iron and manganese. These indicated the concentration for optimal removal efficiency was 8ppm with an ORP of 750 mV, resulting in 97% removal of metals. The system was then modified to increase the precipitant’s size by decreasing the turbulence and shear stresses within the reactor. The modifications were meant to increase the economic feasibility of the system for onsite remediation of acid mine drainage. The results of the new design are currently being analyzed to determine the effectiveness of the modifications.



LOCATION: HHS – ROOM 1302 (Auditorium)

Time: 1:30 – 2:30 p.m.	Presenter’s Names: -Jackson Adolph -Michael DePaola	Capstone Advisor: Dr. Chris Bachmann	Capstone No.: ISAT-48-12T
Concentration: Biosystems			
External Sponsor: Valley 25 x 25			
Capstone Abstract Title: Algal Biofuels: Transforming A Problem Into A Solution			

Capstone Abstract:

Excess nutrient from the Shenandoah Valley has been implicated in promoting algal blooms in the Chesapeake Bay that have caused numerous environmental problems. Concurrently, algae has attracted much attention as a potential feedstock for clean, renewable biofuels. Our research revolves around transforming a problem into a solution: diverting harmful excess nutrient away from the Chesapeake Bay and using this nutrient source in a positive manner to produce clean, renewable fuels that offer numerous environmental benefits. It is estimated that 350,000 tons of poultry litter is generated within the valley that contributes to an overall nutrient load in the entire Chesapeake



bay watershed that consists excess nitrogen and 20 phosphorus; diverting the controlled algae growth not "Save the Bay", but also fuel for the transportation provide an outlet for the phosphorus, it also absorbs fossil fuel which results in a greenhouse gas emissions. Chesapeake Bay fishing \$100 million annually, lost revenue due to excess creating algal blooms and



of 331 million pounds of million pounds of excess excess nutrient to only has the potential to provide clean renewable sector. Not only do algae excess nitrogen and CO2 as well as replacing reduction of harmful It is estimated that the industry, which harvests \$40 million in 2009 in nutrients from farm runoff unfavorable conditions.

Potential fuel created in this process would also positively augment the overall cost savings by displacing fossil fuel costs. This theory can be applied to any system that produces excess nutrient. Utilizing our unique containment strategy that facilitates easy harvesting as well as a chicken litter nutrient source, this system has the potential to alter the fuel and agriculture industries as well as benefit the fishing industry by creating multiple positive environmental impacts.

LOCATION: HHS – ROOM 1302 (Auditorium)

Time: 2:40 – 3:40 p.m.	Presenter’s Names: -Bernard Newman -Scott Teigeler -Jeffrey Wiggins	Capstone Advisor: Dr. Chris Bachmann	Capstone No.: ISAT-49-12T
Concentration: Biosystems, Energy			
External Sponsor: Valley 25 x 25			
Capstone Abstract Title: Alternative Biodiesel Catalyst Research and Development			

Capstone Abstract:

According to the EPA, B-100 Biodiesel reduces total unburned hydrocarbons by 93%, Carbon Monoxide by 50%, and Particulate matter by 30% compared to standard diesel. Farmers in Virginia can reduce air pollution and operating costs by implementing biodiesel that is produced from crops grown locally. In the Shenandoah Valley, farmers currently ship approximately half of their soybean crop to processing facilities in Chesapeake, only to have animal feed shipped back in from distant locations. Local biodiesel production can eliminate this transportation burden by producing both animal feed and clean, renewable fuel within the local agricultural community.

James Madison University is partnering with Shenandoah Agricultural Products in Winchester VA and Fox Run Farms of Rockingham County to help facilitate the development of local biodiesel production. Our group at JMU has



established a gas chromatogram to perform the ASTM D6751 test that is pertinent to insure biodiesel quality by determining glycerol levels. Furthermore, our research into innovative solid phase transesterification catalytic static mixing has the potential to reduce chemical waste and add measurable cost savings to the biodiesel process. The advantage of a solid phase catalytic static mixer is the reduction in the recurring cost of catalyst that is dissolved in the process and cannot be reclaimed. The cost of the catalyst can be up to 6% of the total cost of producing a gallon of Biodiesel. This work was supported by Valley 25x25, which seeks to achieve 25% renewable energy by the year 2025, and this small-scale biodiesel production model can be replicated in agricultural regions across Virginia and across the United States.

LOCATION: HHS – ROOM 1302 (Auditorium)

Time: 3:50 – 4:50 p.m.	Presenter’s Names: -Joshua Magura -Jared Roberds -Timothy Teague	Capstone Advisor: Dr. Chris Bachmann	Capstone No.: ISAT-50-12T
Concentration: Biosystems			
External Sponsors: Harley Davidson, Miller Coors Brewing, Valley 25 x 25			
Capstone Abstract Title: American Motorcycle, American Fuel			

Capstone Abstract:

Ethanol and other renewable fuels such as butanol are being rapidly integrated into the existing petroleum infrastructure in order to decrease dependence on foreign oil and decrease usage of non-renewable fossil fuels. However, it is unclear if these fuels are being utilized to their fullest potential or if integrating them into the fuel infrastructure has caused more problems than they are worth.

In this study, various ethanol/petroleum mixtures (E0, E10, E15, and E85) were evaluated in an internal combustion engine. Data was gathered using an Environmental Systems Product dynamometer to measure the impact on exhaust emissions of the following pollutants: CO₂, CO, HC, and NO_x. All engine operating parameters, including miles per gallon, were tracked using a DynoJet Power Vision data acquisition system. These fuels were subject to specific electronic control unit (ECU) tunings in order to gather baseline data at stock tune and optimal miles per gallon and optimal emission level tunings.

The primary goal of this study was to understand the specific impact of ethanol fuels on engine operating parameters, measure baseline exhaust emission and fuel economy data, and reconfigure the engine's ECU to increase engine efficiency (for both petroleum and ethanol fuels) and decrease overall exhaust gas emissions. The engine modifications done in this study can be applied to any computer-controlled, fuel-injected spark-ignition engine - allowing energy efficiency improvements and pollution reduction on a broad scale.

GEOGRAPHIC SCIENCE PROGRAM

LOCATION: HHS – ROOM 1202

Time: 1:00 – 1:40 p.m.	Presenter’s Names: -Eric Schwind -David Grosso -Kevin McMillan -Jonathan Sanders	Capstone Advisor: Dr. Zachary Bortolot	Capstone No.: GS-01-12T
Concentration: Applied Geographic Information Science (AGIS), Environment			
Capstone Title: Geographic Analysis of the Virginia Freight Industry			

Capstone Abstract:

Between 1997 and 2007, there was a 23% increase in the value of goods shipped via truck. This percentage translates into an additional \$1.9 trillion of commodities. Clearly, the trucking industry is



critical to the sustainability and growth of our nation’s prosperity. Our project examines and analyzes the current freight industry and, in particular, truck drivers. Focusing on Virginia, we used a GIS to display the locations of truck stops, ports, and relevant transportation infrastructure. Using these data, we performed temporal and spatial analyses. In addition to our GIS component, we examined the human element. We surveyed truck drivers at the Harrisonburg Travel Center to gather information about their day to day operations, experience, and basic demographic statistics. We gained valuable insight into the current state of the trucking industry through our interactions with truck drivers. Although truck drivers come from varied backgrounds, the majority of them have a negative outlook towards the industry. As a result of increased operational costs coupled with a struggling economy, the viability of this profession is left uncertain.

LOCATION: HHS – ROOM 1202

Time: 1:45 – 2:10 p.m.	Presenter’s Name: Jake Morris	Capstone Advisor: Dr. Zachary Bortolot	Capstone No.: GS-02-12S
Concentration: Environment			
Capstone Title: Using a Principle Component Analysis in order to locate Unique Ecosystems			

Capstone Abstract:

The goal of this project was to see if unique ecosystems could be located in a study area in the George Washington National Forest by using a principal components analysis (PCA) of multi temporal satellite imagery. PCA was used to compress the data and reduce the redundancy in multiple remotely-sensed images from the same year. After performing this analysis, I located the most extreme digital number (DN) values in the PCA images, which were the extreme outliers and which could possibly represent a unique ecosystem on the ground. The next step was to use a GPS to travel to the locations of these outliers to analyze the flora, fauna, and any distinct landscape features in order to determine if unique ecosystems exist there. The project is important because this technique has never been tried and could help forest specialists locate unique areas of interest for study.

Time: 2:15 – 2:40 p.m.	Presenter’s Name: David Batteiger	Capstone Advisor: Dr. Zachary Bortolot	Capstone No.: GS-03-12S
Concentration: Environment			
Capstone Title: Terrain Analysis and Route Optimization Using High Spatial Resolution Imagery			

Capstone Abstract:

This project aims to execute a route optimization and cost distance analysis for the Caiman Light 4x4 FMTV Multi-Role Protected MRAP vehicle using high spatial resolution imagery and elevation data. ISODATA unsupervised classification will be used to perform image classification based on texture values derived from the imagery and elevation data that have been merged using principal components analysis. The classified image will be combined with slope data to calculate the rate of travel across each pixel and to determine whether the pixel can be traversed. ESRI’s ArcMap products will then be used to perform cost distance analyses and to find the optimal routed between sets of points.

LOCATION: HHS – ROOM 1202

Time: 2:45 – 3:25 p.m.	Presenter’s Names: -Mark Castle -Lee Winslow, IV	Capstone Advisor: Dr. Zachary Bortolot	Capstone No. GS-04-12T
Concentration: Environment			
Capstone Title: Forest Fire Analysis of the Paul State Forest			

Capstone Abstract:

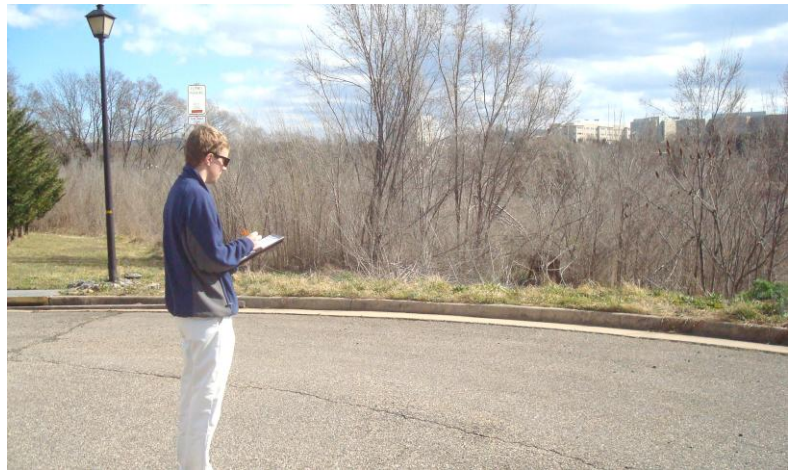
This study seeks to combine digital aerial photography, field work and other data sets to create an accurate depiction of forest fire potential in the Paul State Forest. The aerial photography data were used to calculate a vegetation index as well as second order texture statistics, including the angular second moment, entropy, mean and contrast. For the field work, the center of the sample plots were found by using predetermined GPS coordinates and a 10 meter radius was found using a tape measure to determine which trees were inside the plot. Measurements were then taken to measure the canopy height of the forest using a clinometer. Once the field work is completed, regression equations will be developed for predicting the forest attributes based on the image-derived data values. The equations will be applied to all pixels in the image, and the resulting data layers together with data on elevation, slope, aspect, and canopy cover will be used to parameterize a program called FARSITE, which stands for Fire Area Simulator. The output from FARSITE should give us the ability to model forest fire behavior inside the forest with a high level of accuracy.

LOCATION: HHS – ROOM 1202

Time: 3:30 – 3:55 p.m.	Presenter’s Name: Robert Woodside	Capstone Advisor: Dr. Zachary Bortolot	Capstone No.: GS-05-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: Mapping Tree Cover and Impervious Land Surface Covers in Harrisonburg, Va			

Capstone Abstract:

Trees are an important benefit to a city because they provide ecological services like removing air pollutants and reduced storm water flow. Impervious surfaces are harmful to a city because they increase flooding and erosion. Though each of these aspects are important to a city, they must be balanced so that the city can stay green, both literally and in terms of energy efficiency.



The study used current research (land surveying) and historical (1957, 1966, 1974, 1994, 2006 and 2008) aerial photographs to map tree cover, impervious surface cover (surfaces water cannot penetrate, like sidewalks and roads) and agricultural land in Harrisonburg using digital image processing and field measurements.

To produce the maps, 250 30x30m plots were randomly placed within the current Harrisonburg city limits. All 250 plots were the same place in each photograph. Tree and impervious surfaces were then digitized on the air photos and the areas of each land cover type were calculated. After all tree and impervious surface areas for the 250 plots for each photograph had been calculated, ground surveying was done at 75 random plots, by using a 30 by 30 pixel sheet to map the plots.. The surveying was done over a series of three days in the fall of 2011

The 75 plots measured on the ground were used in conjunction with the data digitized from the 2008 imagery to develop equations to adjust for bias in the digitization of tree cover and impervious surfaces and to assess the error associated with digitization. After the equations we used to correct for bias, the air photo-based estimates were related to metrics extracted from the imagery using stepwise multiple regression. The regression equations were then applied to the entire image to produce maps. These maps were used to assess the locations and magnitudes for changes in impervious surface and tree cover.

LOCATION: HHS – ROOM 1202

Time: 4:00 – 4:25 p.m.	Presenter's Name: Lindsey Luria	Capstone Advisor: Dr. Jennifer Coffman	Capstone No.: GS-11-12S
Concentration: Environment			
Capstone Title: Food Deserts: Harrisonburg Case Study			

Capstone Abstract:

Places in which access to fresh, healthy food is limited by geography, transportation or affordability are known as “food deserts.” The USDA has identified multiple food deserts in Harrisonburg, Virginia, home of James Madison University and a growing city situated in the heart of the agricultural Shenandoah Valley. The USDA food desert map is based on general, national criteria; while it identifies areas that are likely to see nutritional inequalities, it cannot serve as an ultimate indicator of specific communities’ diet issues. The purpose of this project is to examine critically how the food desert label is assigned and evaluate whether food deserts do indeed exist in Harrisonburg. It will address local dynamics and how they can be corrected, as well as the national food system factors causing food deserts to exist.

LOCATION: HHS – ROOM 1204

Time: 1:30 – 1:55 p.m.	Presenter’s Name: Peter Bonsall	Capstone Advisor: Dr. Amy Goodall	Capstone No.: GS-06-12S
Concentration: Environment			
Capstone Title: Laboratory Exercises in Geomorphology			

Capstone Abstract:

Hands-on learning can provide a deeper understanding of concepts that are first learned in lecture. Considering the importance of integrating hands-on activities and experiments with traditional classroom activities, this project was developed to create laboratory exercises for study in an introductory physical geography class. The exercises designed



centered on concepts about Earth’s physical systems and processes, geography of plate tectonics and mountain building, and the influence of glacial advance and retreat on mountain geomorphology. Objectives for the laboratory exercises were based on the learning goals of the physical geography courses at James Madison University and the National Geography Standards of the National Council for Geographic Education. Physical geography texts and other forms of literature were researched in order to design exercise questions and activities. Portions of the exercises were administered to a class and responses to the effectiveness of the lab were recorded. This presentation includes an overview of the methods used to design the exercises, the content of the exercises, a summary of the student responses, and, a hands-on experience for those attending.

LOCATION: HHS - ROOM 1204

Time: 2:00 – 2:25 p.m.	Presenter’s Name: Greg De Angelus	Capstone Advisor: Dr. Amy Goodall	Capstone No.: GS-29-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: Techniques in Biogeographic Learning			

Capstone Abstract:

Biogeography is the study of the distribution and abundances of Earth’s species at multiple spatial scales, during the past and present. The study of biogeography includes a breadth of information from many disciplines including geography, biology, geology, and anthropology. Grasping the concepts of such an integrative science can be challenging for students. The purpose of this project was to design laboratory exercises for helping students understand several biogeography indexes that are used to measure natural biotic communities at the local, regional, and global scales. The exercises focused on trends in dispersal of plant seeds, understanding how changes in land use influence the complexity of a natural food web, and how to identify and outline ecosystem boundaries. This presentation will summarize the labs constructed and demonstrate the concepts in one exercise by providing a hands-on experience.



LOCATION: HHS - ROOM 1204

Time: 2:30 – 2:55 p.m.	Presenter’s Name: Carter Wells	Capstone Advisor: Dr. Amy Goodall	Capstone No.: GS-07-12S
Concentration: Environment			
External Sponsor: Ms. Mary Hope, Harrisonburg Police Department			
Capstone Title: Temporal and Spatial Patterns of Crime in Harrisonburg, VA			

Capstone Abstract:

Geospatial technologies are used by many cities to perform efficient analyses of crime and accidents across space and time. The Harrisonburg Police Department is gaining more interest in the use of geospatial technologies including use of Geographic Information Systems (GIS) to investigate patterns of crime. The purpose of this study was to conduct a pilot project of crime analysis. The



The project represents the potential ties between the interests of the Harrisonburg City Police Department and desires of JMU students to help solve real world problems. The pilot study was designed to investigate spatial and temporal patterns of crime within the City of Harrisonburg from January 2010 to December 2011. Information for the analyses was provided by the Harrisonburg Police Department and transformed for use in ESRI ArcMap technology. The temporal analysis focused on crimes committed during each season of the year, as well as time of day. A kernel density tool was used to identify spatial clusters of crime density. Results showed spatial clusters of crime and vehicular accidents as well as identifiable time periods with higher levels of crime. This presentation is a summary of the research findings and recommendations for the continuation of GIS as a tool for crime investigation within Harrisonburg.

LOCATION: HHS – ROOM 1204

Time: 3:00 – 3:40 p.m.	Presenter’s Names: -Lindsay Cutchins -Lisbeth Rasmussen	Capstone Advisors: -Dr. Amy Goodall -Dr. Wayne Teel	Capstone No.: GS-08-12T
Concentration: Environment, Environment Conservation, Sustainability and Development (ECSD)			
External Sponsor: Ms. Anne Lintner, Keister Elementary School			
Capstone Title: Keister Elementary Vegetable Garden: Linking Environment and Education			

Capstone Abstract:

School gardens provide numerous benefits to children, their families, and the broader community. In order to bring these advantages to Harrisonburg residents, a vegetable and flower garden was designed and constructed at Keister Elementary School. The objectives were to provide an experiential learning, outdoor classroom and learning activities for



students of all grade levels. We focused on the growth of vegetables for spring and fall harvest when the students are attending school. Selection of vegetables to plant was also based on students’ and parents’ use of vegetables at home and the “5 senses” approach, meaning the garden plants attract students to see, smell, taste, touch, and hear in the garden. The learning activities developed emphasize healthy eating, knowledge of plants and their processes, and encouraging children to become aware of their surroundings.

LOCATION: HHS - ROOM 1204

Time: 3:45 – 4:10 p.m.	Presenter’s Name: Rachel Frischeisen	Capstone Advisor: Dr. Amy Goodall	Capstone No.: GS-09-12S
Concentration: Environment			
External Sponsor: Ms. Anne Lintner, Keister Elementary School			
Capstone Title: Designing a Garden for Wildlife Use and Monitoring			

Capstone Abstract:

As urban populations expand and urban spaces increase in size, green spaces in cities are becoming more important for understanding and maintaining biodiversity. Instituting green spaces with natural habitat (habitat patches) promotes biodiversity by providing living space for resident species and stopover sites for migratory species. Habitat patches also enhance the human



community through aesthetics and the opportunity for human interactions with nature. The purpose of this project was to develop a habitat patch for wildlife, for people, and for scientific monitoring of biodiversity in the city of Harrisonburg. Methods for developing the project involved finding a location for the habitat patch, review of literature, and design and implementation of the habitat. During fall 2011, communications with the Harrisonburg Public Schools system brought attention to the possibility of developing a habitat and food garden at Keister Elementary School. The cooperation and encouragement of the school administration for creating a habitat garden and the school’s proximity to neighborhood families made the location ideal for use as bird and butterfly habitat garden. In cooperation with two other Geographic Science students, we designed and implemented a garden that could serve as: a living laboratory for children and their parents, a habitat site for attracting the eight most common native butterfly species of Harrisonburg, a feeding site for several species of native resident and migratory birds. Learning tools and species survey forms were developed so that children and their parents can learn about native species and begin a citizen science biodiversity survey program. This presentation summarizes the process for starting the habitat garden and the species monitoring program. More information about the themes of the garden and the research to develop a garden that connects children and their parents with nature is included. Also included are recommendations for more habitat gardens for the benefit of people and wildlife within the Harrisonburg Community.

LOCATION: HHS – ROOM 1204

Time: 4:15 – 4:40 p.m.	Presenter’s Name: Sean Sutor	Capstone Advisor: Dr. Amy Goodall	Capstone No.: GS-10-12S
Concentration: Environment			
Capstone Title: The Effect of Anthropogenic Activity on Reptiles in Eastern Madagascar			

Capstone Abstract:

Madagascar is a global biodiversity hotspot with a particularly high biodiversity in reptiles. Over 90% of the approximately 300 reptile species are endemic to the island. Though often envisioned as a lush and pristine island, Madagascar is rife with forest degradation and conflict between the conservation of the island’s biodiversity and agricultural land uses. The country’s eastern humid forests support high levels of species diversity but suffer from rapid forest degradation caused by human agricultural activities



performed to meet the needs of Madagascar’s rapidly growing population. This study investigated the effects of anthropogenic activities on the species composition of Madagascar’s forest reptiles. The objectives were to 1) compare species presence/absence in areas with greater anthropogenic disturbances to areas with less anthropogenic disturbances and, 2) compare the observed findings to previous research findings. A thorough literature review of the reptiles of Madagascar’s forests was conducted, including research of the effects of deforestation and other anthropogenic activities on reptile species. Reptiles were observed and photographed in Madagascar, in 5 different forest types with varying levels of anthropogenic activity. Methods used to assess the presence/absence of reptiles in each forest involved (1) opportunistic observation and (2) active searching and refuge examination during day and night. Observations of the diversity and species found within the humid forests of Eastern Madagascar supported the literature. Areas with great variation in vegetation, level of anthropogenic disturbance, and many ecotones were rich in reptile species that are known as generalists. Species listed as forest specialists with habitat requirements associated with more intact natural forests were found in well-protected, remote forest patches experiencing little anthropogenic activity. Continued conservation of the remaining remote forest patches is necessary in order to protect habitat specialists and Madagascar’s reptile biodiversity.

LOCATION: HHS - ROOM 1207

Time: 1:00 – 1:25 p.m.	Presenter’s Name: Andrew Farrar	Capstone Advisor: Dr. Mary Tacy	Capstone No.: GS-13-12S
Concentration: Applied Geographic Information Science (AGIS)			
External Sponsor: National Park Service Delaware Water Gap National Recreation Area Geological Society of America			
Capstone Title: Geodatabase Creation and Implementation at Delaware Water Gap National Recreation Area			

Capstone Abstract:

The purpose of this project was to design, create, and implement a geographic information system (GIS) for the Delaware Water Gap National Recreation Area, a national park located in Milford, Pennsylvania. The idea for this system arose out of the need of GIS users within the park to have a quick way to reference and visualize all recreation opportunities that the park has to offer its



visitors. These recreation features include parking lots, boat launches, hiking trails, trailheads, historical sites, and visitor centers. The method taken in this project was to design an ESRI ArcGIS Geodatabase in such a way that accessing all of these features and their attributes would be easy and intuitive. This project involved an extensive amount of field work, data collection, data processing, evaluation of data, and research of geodatabase design. The final outcome of this work was a geodatabase that could be viewed and queried for access to specific information about the park. This is being used by the GIS users of the park in order to make more informed planning decisions, and by park administrators to inform visitors of what they currently offer in terms of recreation opportunities.

LOCATION: HHS – ROOM 1207

Time: 1:30 – 1:55 p.m.	Presenter’s Name: Zachary Samuelson	Capstone Advisors: -Dr. Mary Tacy -Dr. James Wilson	Capstone No.: GS-14-12S
Concentration: Environment			
Capstone Title: An Impact Study of Unexploded Ordnance in Savannakhet Province, Laos			

Capstone Abstract:

From 1964 to 1973 the U.S. Air Force conducted an average of one bombing raid every nine minutes for nine years thus making Laos the most heavily bombed country per capita in the world. One of the most heavily impacted areas in Laos was the province of Savannakhet. The goal of this project was to conduct an analysis of landmine and unexploded ordnance (UXO) impact in Savannakhet Province. A series of maps and other visualizations were produced or accessed using ArcMap and Google Earth. The data consisted of ArcMap shapefiles (.shp) Google Earth files (.kml), raster images, grid files (.grd), .jpeg images .bitmap images, and aerial photos. By using the available tools and algorithms within the ArcMap software, meaningful patterns of environmental and human relationships were displayed and analyzed to discern the types of impact involved. It is hoped that the research and products of this study will benefit the UXO sector strategy in Laos and provide a basic example for identifying and prioritizing the most impacted regions in Savannakhet. This study has added to the greater mine action community knowledge base, as well as raised UXO awareness at JMU.



LOCATION: HHS – ROOM 1207

Time: 2:00 – 2:25 p.m.	Presenter’s Name: John Pettitt	Capstone Advisors: -Dr. Mary Tacy -Dr. Zachary Bortolot	Capstone No.: GS-15-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: Using Remote Sensing Techniques to Analyze Environmental Change on La Gonave Island, Haiti			

Capstone Abstract:

La Gonave suffers from frequent natural disasters and extensive human modifications which makes the island a perfect candidate for change detection analyses through remote sensing techniques. La Gonave is an island in the Caribbean where mangroves are frequently cut down for selling as charcoal. Mangrove forests lead to a lack of a vegetative buffer against storms. This research deals with monitoring temporal changes, using image processing software to highlight locations in a 25 km² study area affected by natural and human-induced environmental degradation. Multispectral and panchromatic imagery from 2006 and 2010 are used to analyze land cover changes. Data processing techniques include: image georectification to assign coordinates to pixels and reduce geometric distortion; pan-fusion of the panchromatic with multispectral bands to aid in visual interpretation; and, an unsupervised classification in order to categorize the various land types. Change detection analysis and land cover classification of La Gonave using high spatial resolution imagery is the first step in developing a methodology for monitoring environmental conditions on the island. This research creates a foundation for natural disaster management or utilization with other geospatial technologies like geographic information systems (GIS). A major way integration with a GIS could aid in the mitigation of natural disasters and human-induced modifications of the landscape is to overlay classified remote sensing images that have been georeferenced into digitized administrative boundaries, with the aim of correlating cultural and physical data.



LOCATION: HHS – ROOM 1207

Time: 2:30 – 2:55 p.m.	Presenter's Name: Darci Bohmer	Capstone Advisors: Dr. Mary Tacy	Capstone No.: GS-16-12S
Concentration: Environmental Conservation, Sustainability and Development Concentration (ECSD)			
Capstone Title: Sustainable Urban Design: Lessons Learned from European Cities			

Capstone Abstract:

As the contemporary American landscape has become one of suburban sprawl, countless environmental and human health problems have been encountered. On the contrary, the European landscape is primarily one of dense urban settlements, avoiding many of the problems experienced by those who bought into the “American dream” associated with the move to suburbia. This project examines the differences between the prevailing land development paradigms between the two geographical entities and highlights the human and natural benefits of the latter. Through research of the literature in the field, the principles and benefits of the “Sustainable Urbanism” movement are explored in detail. In addition, various urban case studies from the developed world which exhibit design methods from the movement are examined. Overall, it is discovered that dense, mixed-use landscapes which encourage pedestrian lifestyles, decreased personal car use, and time spent outdoors are those which reaped the most benefits for both the natural environment and human population. In summary, the average European city model is one which the United States should strive to reflect in its own land development in order to maximize health benefits for both its urban populations and the natural world alike.

LOCATION: HHS – ROOM 1207

Time: 3:00 – 3:40 p.m.	Presenter’s Names: -John Caccavale -Tim Kennedy	Capstone Advisors: -Dr. Mary Tacy -Dr. James Wilson	Capstone No.: GS-17-12T
Concentration: Environment			
Capstone Title: La Gonave, Haiti: An Inventory of Geospatial Data and Aid Organizations			

Capstone Abstract:

The island of La Gonave, Haiti, located 20 miles west of the capital city, Port-au-Prince, has experienced extreme poverty and neglect for decades. While many nongovernmental organizations are actively working on the island, there has been little communication or cooperation among them. The purpose of this project was twofold: to survey aid organizations on the island and create a central database of information regarding project locations and details; and, to inventory relevant geospatial data of the island for future access. The survey data were summarized for inclusion in a geospatial shapefile layer to be overlaid against a basemap of the island for reference. The inventory of GIS data and satellite imagery was compiled in a spreadsheet so interested parties can easily connect with data providers. This project will streamline the assistance efforts on the island of La Gonave and provide the professionals and volunteers working there with an understanding of what programs have been implemented and where data are available



LOCATION: HHS – ROOM 1207

Time: 3:45 – 4:10 p.m.	Presenter’s Name: Austin Gore	Capstone Advisors: Dr. Mary Tacy	Capstone No.: GS-18-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: Evaluating Potential Micro Home Energy Systems for the Village of Nan Boukan, Haiti.			

Capstone Abstract:

Haiti has long been plagued by problems characteristic of developing countries. This includes a total lack of electricity in many parts of the country, such as in the remote village of Nan Boukan on La Gonáve Island. This small fishing community of 31 households is located on the south-central coastline of the island, and has no reliable source of electricity. The objective of this study is to examine various low cost, low output power systems in order to recommend the best system for distributing power in the village. This took place through the research of micro home energy production, the determination of the electricity needs of Nan Boukan, sizing the various systems, and the completion of a cost benefit analysis of the selected systems. Four systems were selected for research: a commercial low cost, low watt solar photovoltaic system, a system that involves batteries for home use that are centrally-charged using solar photovoltaics, a system that involves batteries for home use that are centrally-charged using a small portable generator, and a system that uses commercial “hand-cranked” appliances. It was found that a hand-crank/photovoltaic combination lantern would be an inexpensive and efficient system to provide lighting and cell phone charging capabilities. For additional power needs, a small photovoltaic system would be appropriate.



LOCATION: HHS - ROOM 1207

Time: 4:15 – 4:40 p.m.	Presenter’s Names: -Daniel Bartnick -Alvaro Campomanes -Devin Diver -Natalie Stichel	Capstone Advisor: Dr. John Gentile	Capstone No.: GS-31-12T
Concentrations: Applied Geographic Information Science (AGIS) Environmental Conservation Sustainability and Development Concentration (ECSD)			
Capstone Title: Making the University Farm a Sustainable Outdoor Classroom: Lessons from Costa Rica			

Capstone Abstract:

Costa Rica has been practicing the art of permaculture for hundreds of years. A nation smaller than most U.S. states has learned that cherishing education and conserving 5% of the world's biodiversity promote a prosperous environment, economy, and culture. Countless small farms practice sustainable agriculture, working within nature's model of low-input high productivity. Costa Rica aims to be the first carbon-neutral country by 2021, while other nations struggle to reduce emissions. James Madison University, having committed itself to environmental stewardship, is working towards carbon-neutrality, but there is one often overlooked part of JMU that has enormous potential for cross-disciplinary research opportunities, responsible food production, and carbon sequestration.

The University Farm was once a weekend escape for students and the humble beginning of environmental education at JMU, but the 30-acre parcel’s popularity has been steadily declining for decades. The goal of this project is to devise a renovation of the farm inspired by Costa Rican models that will not only transform it into a sustainable, productive classroom but also serve as an extension of JMU’s vision to reach eventual campus-wide carbon-neutrality. This project’s objectives propose several phases of land preparation, implementation of sustainable systems, integration of the farm into the JMU Master Plan, and ideas for future renovations and maintenance.

LOCATION: HHS - ROOM 1207

Time: 4:45 -5: 10 p.m.	Presenter's Name: Leslie Keller	Capstone Advisor: Dr. John Gentile	Capstone No.: GS-34-12S
Concentration: Environmental Conservation Sustainability and Development Concentration (ECSD)			
Capstone Title: The Green School: An Environmentally-Centered Approach to Learning In Bali, Indonesia. A documentary			

Capstone Abstract:

In modern society there are many barriers that separate people from their environment. As environmental degradation becomes a more significant issue in the public eye, there is greater stress on lessening the influence of some of these barriers in order to increase awareness and move towards change. At the forefront of this movement is education.

While environmental education and learning programs focused on sustainability and conservation are becoming increasingly popular, the setting for many of these programs is still in typical classrooms, shielding students from the very subject they are learning about. These programs are also generally limited to students in high school, college, and graduate school. In Bali, Indonesia, however, is the new and innovative Green School. Founded by John and Cynthia Hardy in 2006,

The Green School was created to serve local and international students from pre-school through 12th grade. Located in the jungle, it's striking bamboo classrooms and gathering areas have no walls, facilitating constant, genuine interaction with nature. This unique school creates interest and caring for the environment from a young age, while providing an excellent, holistic education for students of many different backgrounds. In order to better understand how The Green School operates, I traveled to Bali in June, 2011 to film the campus and interview staff members and students. What I discovered was that, while The Green School is still very much a work in progress, it has already had an incredible impact on students and the local community in the four short years it has been open, and will continue to grow and develop in creative and groundbreaking ways.

LOCATION: HHS - ROOM 1209

Time: 10:00 – 10:25 a.m.	Presenter’s Name: Patrick Trimble	Capstone Advisor: Dr. Carol Nash	Capstone No.: GS-19-12S
Concentration: Environmental Conservation, Sustainability and Development Concentration (ECSD)			
Capstone Title: Digital Photography in Biogeographic Field Studies: How to Incorporate Photography into the Contemporary Geographic Curriculum			

Capstone Abstract:

This research explores the role of fieldwork in geography and the pedagogical benefits of using photography in the contemporary geography curriculum. It addresses the question of how photography can be used as an effective learning tool within the discipline. More specifically, this research demonstrates that photography -- especially digital photography-- is an excellent and low-cost supplement to more



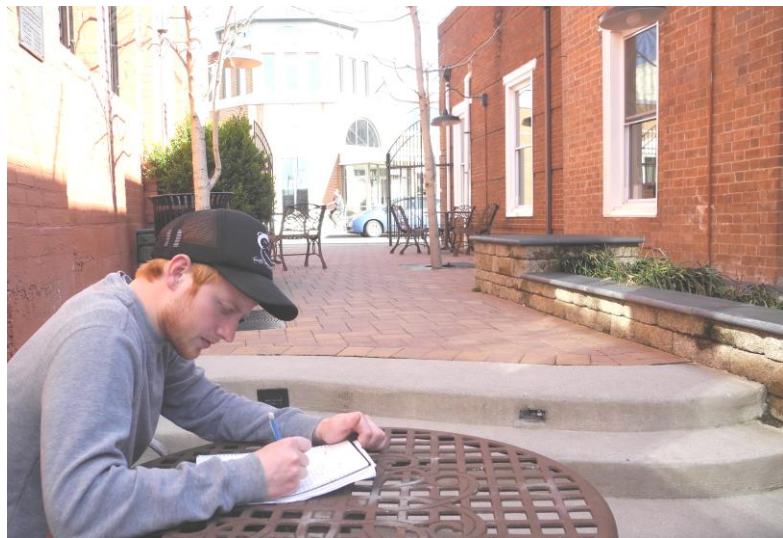
traditional methods of geographical fieldwork. Many geographic phenomena can be overlooked through simple field observation; however, through the careful lens of the camera, the geographer is able to obtain and retain a great deal of information while in the field. Photography provides a superb observational tool that offers an understanding of the subject being studied beyond that which is possible in the classroom alone. It allows the geographer the ability to maintain a dialog with the image captured both in the field and during any subsequent analysis. A photographic study of the variety of butterfly species inhabiting the James Madison University Arboretum in Fall 2011 provides a strong example of the application of digital photography in geographic field work. The photographs and personal experiences that were made possible through this study produced a much deeper understanding of the promise that photography holds for the contemporary geography curriculum.

LOCATION: HHS - ROOM 1209

Time: 10:30 – 10:55 a.m.	Presenter's Name: Stefan McFayden	Capstone Advisor: Dr. Henry Way	Capstone No.: GS-20-12S
Concentration: Environment			
Capstone Title: Green Space at the Neighborhood Scale: The Importance of Geography to "Smart Growth"			

Capstone Abstract:

Contemporary urban planning and design theories suggest that neighborhoods are key building blocks in the urban environment. The neighborhood arguably represents the most appropriate scale of human interaction with the environment in cities, composing within walking distance the immediate needs and destinations of daily life. The compact neighborhood has been promoted in recent urban planning theory as one of the key elements of "smart growth".



According to understandings of "biophilia", green space is an essential human need but ill-planned urban development can lead to a deficiency of natural environments in cities. This study analyzes green space in Harrisonburg, Virginia, by quantifying existing green space, determining the areas in which green space can be improved or implemented, and discussing potential solutions to improve the livelihood of city residents.

A primary emphasis of this study is the importance of scale when designing green space areas. This study discusses the importance of successful green, includes maps depicting green space analyses in Harrisonburg and the methods for conducting the analyses. Also included in the discussion are examples of successful and unsuccessful design in other cities that offered valuable assistance throughout the assessment of Harrisonburg neighborhoods. A key analysis and insight demonstrated here is the opportunity for effective development of green spaces at the neighborhood scale, using tools provided by urban geography theory and GIS.

LOCATION: HHS - ROOM 1209

Time: 11:00-11:25 a.m.	Presenter's Names: -Jonathan Belmonte -Scott Bentley	Capstone Advisor: Dr. Maria Papadakis	Capstone No.: GS-30-12T
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: A Geography of Global Consumption			

Capstone Abstract:

The new global economy and modern telecommunications have made our planet a smaller place and brought both prosperity and poverty to much of the world. The researchers chose to explore the idea of a global economic chain split into four sections: natural resource extraction, processing and manufacturing, distribution and consumption, and disposal and waste. The researchers collected and analyzed economic data and various economic indicators in order to better explore the effects of globalization on both people and planet. By spatializing these indicators and observing the patterns associated with the phenomenon of globalization we hope to reassess the suitability of a linear economic system in a finite world, and better inform the discourse concerning issues of international development and sustainability.

Time: 11:30 - 11:55 a.m.	Presenter's Name: David Hertle, Jr.	Capstone Advisor: Dr. James Wilson	Capstone No.: GS-22-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: The American Dream Index			

Capstone Abstract:

The United States has historically been a mobile nation. People have been free to migrate from state to state, and many do. When given the opportunity to choose where to live, have people moved to increase their personal liberty as some studies have suggested? While federal laws are homogenous in distribution, the laws of individual states along with their geography create a heterogeneous distribution of standards of living and hence contribute to migration trends. Freedom in the workplace, climate, nature densities, per capita taxation, personal happiness, personal safety, economic opportunities, and proportions of poverty were compared to migration trends to try to define what people were looking for when they sought the best that America has to offer. A model was developed to analyze all of the variables to determine which variables and their weights to use in the creation of the American Dream Index. The robustness of the American Dream Index was tested by comparing it to the Freedom Index developed by the Mercator Institute, which had previously demonstrated a relationship to net migrations.

LOCATION: HHS - ROOM 1209

Time: 1:30 – 1:55 p.m.	Presenter’s Names: -Leo Dove -Jason Lieu -Zachary Smith	Capstone Advisor: Dr. Michael Deaton	Capstone No.: GS-28-12T
Concentration: Environment, Applied Geographic Information Science (AGIS)			
Capstone Title: The Effect of Hurricanes Along the Gulf Coast			

Capstone Abstract:

This study focuses on a hurricane’s worst case scenario to impact the states along the Gulf Coast of the United States. The principles and technologies of Geographic Information Systems (GIS) were used in this project to analyze, plan and prepare for such case scenarios with a natural disaster planner’s approach in mind. This study used a geographic information system-based natural hazard loss estimation software package called HAZards United States (HAZUS) that is developed



by the Federal Emergency Management Agency (FEMA) to determine the damages caused by a hurricane in each location. The simulation of the hurricane’s path and intensity was generated by using the Sea, Lake and Overland Surges from Hurricanes (SLOSH) software. This study was able to use the computerized model ran by the National Hurricane Center (NHC) to estimate storm surge heights and winds resulting from historical, hypothetical, and predicted hurricanes by taking into account the following: pressure, size, forward speed, track, and winds.

The holistic purpose in this study revolves around the four stages that natural disaster planners prepare for, which are mitigation, preparedness, response, and recovery when strategically planning for natural hazards. In choosing the parameters and locations of this project, the team had to research the intensity of the storm and the amount of occurrences that the hurricanes have affected the Gulf Coast States. Given these constraints, the team came to a decision to perform the simulations and analyses on the following three locations: Tampa Bay, Florida; New Orleans, Louisiana; and Galveston, Texas. This study integrated the physical hazard data (hurricane and storm surge data) with population data, and damage prediction, which inherently produced useful results in the reports that could pose as useful information for future hurricane evacuation planning.

LOCATION: HHS - ROOM 1209

Time: 2:00 – 2:25 p.m.	Presenter's Name: Robert Heidelberg	Capstone Advisors: -Dr. Michael Deaton -Dr. Henry Way	Capstone No.: GS-29-12S
Concentration: Applied Geographic Information Science (AGIS)			
External Sponsor: United States Army Corp of Engineers			
Capstone Title: Iraqi Geodatabase			

Capstone Abstract:

In order to keep our war fighters educated and familiar with their surroundings during tours all over the world, The United States Army Corp of Engineers is creating a cultural geography database for every country on earth. I have been chosen to analyze and create a GIS of Iraq that consisting of many different characteristics of the country, such as population density, languages spoken, and geographical features (everything from human geography to physical geography). This project seeks to familiarize our soldiers with areas that are totally foreign to them, in an easy, open source GIS. Existing hard-copy maps will be digitally converted and implemented into each country's database; they will be available via internet and download to be used while in leisure or even on the front lines. Soldiers are now being issued smart phones as part of their military gear, and this will be an available app. A component of this project is a brief analysis of mapping conflicts in Iraq since the beginning of Operation Iraqi Freedom, to show the potential use of the Iraqi geodatabase. Making this geodatabase available to the public and expert geographers opens up a world of analytical possibilities.

LOCATION: HHS - ROOM 1209

Time: 2:30 – 2:55 p.m.	Presenter's Name: William Harris Weaver	Capstone Advisor: Dr. Helmut Kraenzle	Capstone No.: GS-23-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: Applications of Fractals to Geography and Spatial Analysis			

Capstone Abstract:

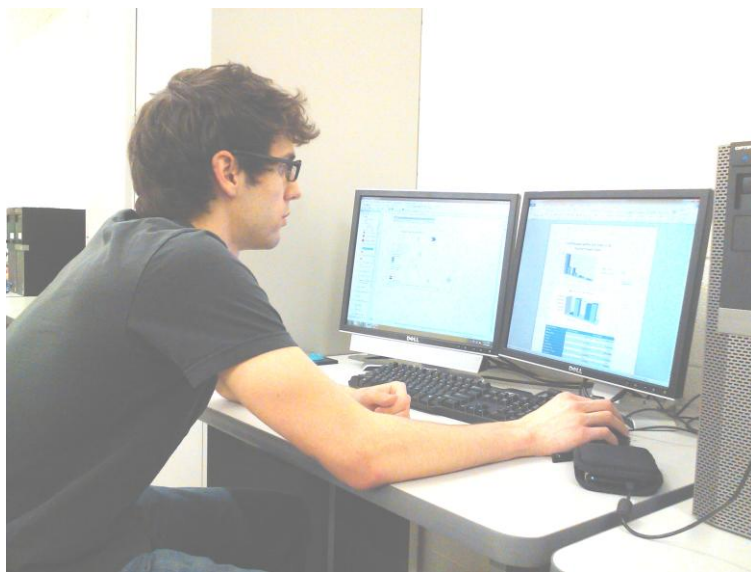
The purpose of this report is to exhibit approximate fractal patterns and how they apply to geography and spatial analysis. Objects are considered fractal in nature when they are too complex to be described with traditional Euclidean geometry, while maintaining a simple and recursive definition with a fine structure at arbitrarily small scales. Many phenomena in nature exhibit approximate fractal patterns, including clouds, river networks, fault lines, mountain ranges, craters, snowflakes, crystals, lightning, cauliflower or broccoli, and ocean waves. Fractal functions iterate indefinitely, and are visualized with computers. A complex number that changes after each iteration is plotted on complex planes, where the horizontal axis represents real numbers, and the vertical axis represents imaginary numbers. The Mandelbrot set is perhaps the most notable example of the intricacy of fractals, and is representative of a major advancement in fractal set theory. Recent research suggests fractals are widely applicable to geography and spatial analysis, such as soil patterns, oil spill detections, human development patterns, river systems, biogeographic mapping, and digital elevation modeling. A java program demonstrates the visualization of a fractal set with defined variables and constants.

LOCATION: HHS - ROOM 1209

Time: 3:00 – 3:25 p.m.	Presenter’s Name: Michael Mayobre	Capstone Advisor: Dr. Helmut Kraenzle	Capstone No.: GS-24-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: Risk Assessment Of Possible Nuclear Meltdown Scenario Of California Nuclear Power Plants Compared To Historical Nuclear Disasters			

Capstone Abstract:

The Chernobyl disaster in Ukraine was the worst nuclear disaster in history, and its effects are still felt to this day. Recently the devastating 9.0 earthquake and tsunami that ravaged Japan caused a nuclear crisis at the Fukushima Daiichi Nuclear Power station. These are two of the biggest nuclear accidents so far in human history, but one has to ask



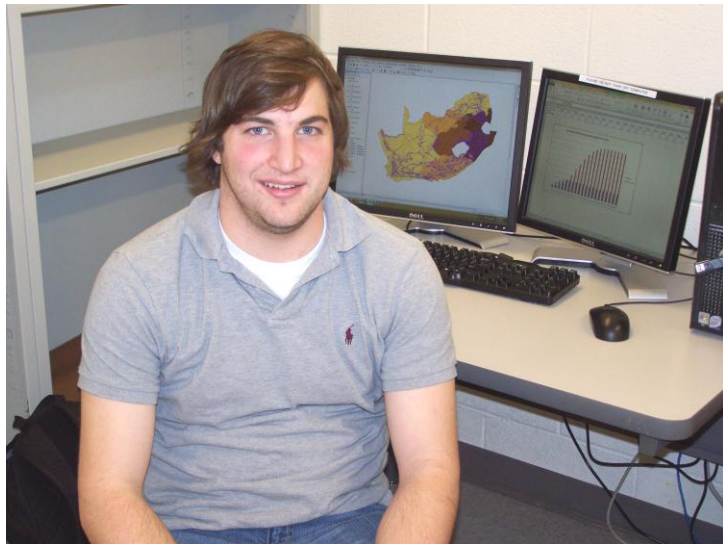
where else could this same situation occur in the world? What other nuclear power plants out there are vulnerable to earthquakes and tsunamis? The purpose of this study is to examine both of these events and apply what we already know to a possible scenario. A major focus of this study will be on California, specifically the Diablo Canyon nuclear power plant, and the San Onofre nuclear power plant. The reason why these two places were chosen is because California, especially the southern part is very vulnerable to seismic events, which is where both of these plants are located. From a geographical perspective, the locations of the plants show that they seem to be dangerously close to fault lines that run along the southern coast of California. The power plants are also settled right on the coast, which exposes them to any possible ocean and coastal hazards. Research and data from the Chernobyl and Japan disasters will help create a simulation of a nuclear meltdown for these two power plants in California. Spatial analysis will be conducted using Arc GIS software, which will also map the risks and damages of the disasters and possible scenarios.

LOCATION: HHS - ROOM 1209

Time: 3:30 – 3:55 p.m.	Presenter’s Name: Michael Eastham	Capstone Advisor: Dr. Helmut Kraenzle	Capstone No.: GS-25-12S
Concentration: Environment			
Capstone Title: Investigation and Analysis of the HIV/AIDS Epidemic in South Africa and Nigeria			

Capstone Abstract:

Since its discovery and emergence, the HIV/AIDS outbreak has progressed very differently throughout various regions of the world; the continent of Africa continues to be most affected by the epidemic. Two African countries in which the HIV/AIDS epidemic has developed in a very different manner are Nigeria and South Africa. In the early 1990s, the disease was more prevalent in Nigeria than in South Africa;



however, beginning in the mid-1990s the prevalence of HIV among South Africa’s population continued to increase very rapidly while it slowly declined in Nigeria. Currently the HIV/AIDS prevalence among adults in Nigeria is estimated to be around 3.6%, while in South Africa it has grown to around 17.8%. Explanations for the development of the HIV/AIDS outbreak within South Africa and Nigeria can be addressed through research into various cultural, social, economic, political, and physical differences between the two countries. In addition, the use of Geographic Information Science (GIS) can be utilized to map and identify areas with relatively high or low HIV/AIDS prevalence. Further explanations that account for the spread of the epidemic can be assessed by conducting spatial analysis on geographic phenomena associated with the prevalence of disease. The results of this research identify factors that act to either encourage or reduce the spread of the disease. Consequently, conclusions drawn from the research can be used to identify potential methods of HIV/AIDS prevention.

LOCATION: HHS - ROOM 1209

Time: 4:00 – 4:25 p.m.	Presenter’s Name: William Gilrain	Capstone Advisor: Dr. Helmut Kraenzle	Capstone No.: GS-26-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: Crime Analysis			

Capstone Abstract:

The goal of this project is to create a GIS of crime analysis. After talking with my advisor we decided that due to the nature of the information in the project, only a general description of the project will be provided in the abstract. The methods I used included conducting research on my topic and then creating a GIS using ESRI’s ArcMap software.

The research stage of the project included reading articles, looking at intelligence resources, and searching for data. The next step in the project was creating a GIS. I used the GIS to visualize the data and perform spatial analyses such as density analyses and interpolation. The GIS was also used to combine layers in order to analyze the information and compare crime to different factors. Some GIS techniques used included heads up digitizing, cartographic modeling, address geocoding, and data compilation and management. The data that was used includes place names for geocoding, population, cities, agricultural areas, schools, electricity usage, GDP, vegetation, and various crime data. The end product includes a GIS based on input data and the methods applied. An online GIS prototype was created using ESRI’s ArcGIS.com as well as hard copy maps showing crime compared to different factors. A report on the economic impacts, as well as a report on the analysis of multiple factors contributing to crime was created as well.



LOCATION: HHS - ROOM 1209

Time: 4:30 – 4:55pm	Presenter’s Name: Brian W. Moran	Capstone Advisor: Dr. Helmut Kraenzle	Capstone No.: GS-27-12S
Concentration: Applied Geographic Information Science (AGIS)			
Capstone Title: Rich-Internet GIS Application Development Example: Nuclear Power Plants and Fault Areas in the United States			

Capstone Abstract:

In all fields of information technology, the role of the Internet is as important as ever, and is always growing. In order for information to be distributed and shared, datasets need to be synthesized in a way that will allow numerous audiences all over the world to access and utilize them. There is no exception to this principle in the realm of Geographic Information Systems (GIS). The development of rich-internet applications has become a crucial discipline in GIS, and there are many avenues to accomplish these types of applications. While there are many templates provided by companies such as ESRI, the only way to achieve true customization is to use integrated development environments using application frameworks (such as Microsoft Silverlight and Adobe Flex). My project shows an approach to developing an ArcGIS based application in the Visual Studio 2010 development environment using the Silverlight application framework. The application I have developed looks at nuclear power plants in the United States along with quaternary fault lines and areas, an issue that has come to the forefront of the nation’s and the world’s attention following the 2011 earthquake and subsequent tsunami in Japan that caused massive destruction and ongoing nuclear issues at the Fukushima nuclear power station. The application is very effective in demonstrating the proximities of nuclear power plants to earthquake-prone areas, as well as their spatial relation to population centers.

GEOGRAPHIC SCIENCE PROGRAM**POSTER PRESENTATION**

Location: 1 st Floor HHS Hallway	Presenter's Name: Grant Collier	Capstone Advisor: Dr. Henry Way	Capstone No.: GS-21-12S
Concentration: Environment			
Capstone Title: Opportunities and Challenges for Urban Growth Boundaries: A Case Study of Harrisonburg, Virginia			

Capstone Abstract:

An Urban Growth Boundary (UGB) is a tool that planners can use to promote smarter growth within a city. This poster will examine the theory of UGBs, and the geographical realities of their implementation.

This poster will present different recommendations for an Urban Growth Boundary or equivalent for Harrisonburg with analysis of the pros and cons of each. Recommendations will include a traditional UGB within the confinements of the City of Harrisonburg, another will focus on strategic locations where growth within the city should be concentrated instead of a citywide UGB, and another will take an approach where Rockingham County and the City of Harrisonburg develop a single UGB together within the city and county for the conservation and density benefit of both.

In addition to briefly exploring the theoretical forms, benefits and implications of a UGB, this poster will demonstrate the importance of geographical and political context in the development of urban growth boundaries. In particular, while we may hold up an "ideal" form of UGB, the unique contexts of each city might prompt a fundamental reworking of the concept in practice and implementation. Harrisonburg presents a productive example given the growth pressures and diverse political and policy-making background. Once support is formed, there are still a number of obstacles specific to Harrisonburg which will prevent creating a UGB from being an easy task. Despite the obstacles the project would inevitably encounter, the benefits within social, economic, and environmental realms make it an attractive prospect for the city.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

Location: 1 st Floor HHS Hallway	Presenter's Name: Stephen Fessenden	Capstone Advisor: Dr. Jennifer Coffman	Capstone No.: GS-12-12S
Concentration: Environmental Conservation Sustainability and Development Concentration (ECSD)			
Capstone Title: Perceptions of United States Military Interests and Competencies in Afghanistan			

Capstone Abstract:

Questions have arisen in popular media, as well as among military personnel, about whether improving United States military efforts to better understand local Afghan cultures could enable them to achieve their goals more quickly and effectively. This research project attempts to respond to these claims through archival research and by examining perceptions of United States Military interests and competencies in Afghanistan.



Three strands of information are being utilized in this project. The first strand is literature analysis, including online databases, textbooks, nonfiction books, peer-reviewed articles, and official government documents. The second strand includes 7-10 semi-structured, open-ended interviews with military personnel who have experienced war in Afghanistan, as well as other expert civilian sources. The third strand of data is from a minimum of 100 completed surveys given to a representative sample of the JMU student population to gauge their understandings and opinions of US military engagement in Afghanistan.

GEOGRAPHIC SCIENCE PROGRAM**POSTER PRESENTATION**

Location: 1 st Floor HHS Hallway	Presenter's Name: Alexander Haney	Capstone Advisor: Dr. John Gentile	Capstone No.: GS-32-12S
Concentration: Environmental Conservation Sustainability and Development Concentration (ECSD)			
Capstone Title: A Holistic Approach to Biochar Utilization			

Capstone Abstract:

Bio-char" is a neutral form of carbon produced through the process of pyrolysis that, when applied to soils, has the potential to enhance the physical and chemical properties of soils for the development of healthy and productive ecosystems.

The increasingly frequent and environmentally destructive consumer-based trends of the more industrialized and 'developed' countries have led a globalizing population to become more and more dependent on its resource base. Without a drastic revolution and/or revitalization movement directed toward the reestablishment of the balance and relationship between the planet's natural cycles and human existence, the planet's ecosystems will continue degrade.

Biochar utilization represents a potential practice to redirect humans away from their current parasitic dependency on the environment and to instead promote and preserve a more balanced, symbiotic, and productive human-environment relationship that will sustain the biological and ecological diversity of the planet.

GEOGRAPHIC SCIENCE PROGRAM

POSTER PRESENTATION

Location: 1 st Floor HHS Hallway	Presenter's Name: Caryle Keller	Capstone Advisor: Dr. John Gentile	Capstone No.: GS-33-12S
Concentration: Environment			
Capstone Title: An Analysis of the Effects of the Mountain Pine Beetle Epidemic on the Niche of the Northern Goshawk			

Capstone Abstract:

As climate change continues to escalate, certain species are proliferating and negatively affecting the ecosystems they inhabit. One such species is the Northern Goshawk who's habitat is being reduced due to increased timber management.

Within the Routt National Forest there has been an increase in Mountain Pine Beetle populations (*Dendroctonus ponderosa*). This increase has been related to alterations in the climatic limitations of beetle survival. The Mountain Pine Beetle and the Lodgepole Pine have shared in a symbiotic relationship. However, with a recent loss of winter cold snaps and an abundance of mature old-growth trees, beetle populations have infested and overwhelmed Lodgepole Pine forests. The bark beetle epidemic has created serious problems for the spread of wildfires, and an increased amount of hazard trees. The primary response has been focused on salvage of economically viable beetle-killed wood and the mitigation of wildfire and hazard trees from public access areas. While these are very important activities to address, careful consideration of the ecological impacts must be explored.

A geographic information system (GIS) was used to model the amount of optimal habitat of the Northern goshawk lost due to human hazard tree mitigation and the potential salvage treatment of viable timber within the Routt National Forest, RNF. It was found that 46% of the forested lands within RNF are Lodgepole Pine. Of this 46%, 4.85% will be removed for human hazardous tree mitigation around all recreational sites, roads, and trails and 1.98% exists as "pockets" of beetle infestation having the potential to be timber harvested for salvageable lumber.

In understanding the ecological impacts of forestry management techniques (particularly used in mitigation of human hazards) and the habitat requirements of indicator species such as the Northern Goshawk, forestry and wildlife managers can optimize timber harvesting without sacrificing biological diversity.

LOCATION: ISAT – ROOM 348

<p>Time: 8:30 – 8:55 a.m.</p>	<p>Presenter’s Names: -Madeline Culbreth -Madison Shinaberry -Nicholas Wright</p>	<p>Capstone Advisor: -Dr. Ronald Raab</p>	<p>Capstone No.: ISAT-51-12T</p>
<p>Capstone Title: Isolation of Multiple Bacteriophages From Soil Containing 6 Different Types of <i>Bacillus</i> Bacteria</p>			

Capstone Abstract:

With the emergence of antibiotic-resistant bacteria it is crucial to find alternative methods of treating bacterial infections. One approach to address this concern is the use of bacteriophages, viruses that kill bacteria. In order to use bacteriophages more effectively as a possible replacement for antibiotics more research about the genes involved in the mechanism of lysis (the killing of bacteria) is needed. A soil sample with 6 different species of *Bacillus* bacteria has been located and used to isolate pools of *Bacillus* bacteriophage to the 6 different *Bacillus* bacteria. DNA from each of the 6 different *Bacillus* bacteriophage pools were isolated and tested for the presence of 2 lysis genes that were identified from a *Bacillus pumilis* phage isolated at James Madison University. Using Polymerase Chain Reaction (PCR) it was found that 3 other strains of *Bacillus* bacteria have phages may contain *B. pumilis* phage lysis genes.

INTELLIGENCE ANALYSIS PROGRAM

LOCATION: ISAT – ROOM 348

Time: 9:00 – 9:20 a.m.	Presenter’s Name: Curtis Smith	Capstone Advisors: -Dr. George Baker -Dr. Jeffrey Tang	Capstone No.: IA-01-12S
Capstone Title: The Threat of an Electromagnetic Pulse			

Capstone Abstract:

An EMP or electromagnetic pulse is burst of electromagnetic radiation or energy. It can be caused by two main sources including a high altitude nuclear burst or a large solar storm. A nuclear weapon detonated at 300-400 km altitude in the Earth's Ionosphere would have enough power to affect much of the contiguous United States. This symposium examines the different types of EMPs that the United States should be concerned about and what countries or non-state actors pose the most significant threat to utilize one.

Time: 9:25 – 9:45 a.m.	Presenter’s Name: Allen Frazier	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-02-12S
Capstone Title: Security Concerns for the London 2012 Olympic Games			

Capstone Abstract:

This presentation will address strategic and tactical security problems related to the London 2012 Olympic Games. Strategic concerns such as the threat of international terrorism represent a great concern for the security and safety of the games. At a tactical level, the vulnerability of Olympic venues (such as the Olympic Park) is decreased with the implementation of physical barriers, personnel, and other technologies. The problem will also be addressed from the point-of-view of a spectator or Olympian and their unique perspective.

LOCATION: ISAT – ROOM 348

<p>Time: 9:50 – 10:20 a.m.</p>	<p>Presenter’s Names: -Kristyl Lankford -Ashley Papen -Alison Schroeder</p>	<p>Capstone Advisor: Dr. Jeffrey Tang</p>	<p>Capstone No.: IA-03-12T</p>
<p>Capstone Title: Combating and Monitoring Gang Activity in the Los Angeles Metro Area</p>			

Capstone Abstract:

Gang activity in the Los Angeles, California area continues to flourish due to many different factors. In discovering these factors, we look to form strategies in which we can combat and monitor the increasing gangs and their activity. We are analyzing all of the factors that are driving the current activity of gangs in the Los Angeles area (specifically MS-13, the Bloods, and the Crips), and what is allowing them to thrive.

We are using a causal loop diagram in order to display the connections and relations between certain factors. Even though we are looking at factors for each individual gang, we are also looking at all three and searching for similarities and differences. We are looking into possible scenarios that could develop into the future by using quadrant charts. By analyzing these gangs we will assess them based on certain situations that could arise. Counterfactual reasoning is playing a role in our strategy assessment by analyzing the trends and from these trends, developing possible strategies.

We are researching ways in which we can combat and monitor the gang activity, rather than aiming to eliminate gangs. Through our course of analysis we are developing several different strategies in which will help our audience gain a better understanding of how to combat and monitor these three thriving gangs. We are projecting and explaining these possible courses of action by analyzing the threats and opportunities that involve these gangs in threats to national security for local law enforcement.

LOCATION: ISAT – ROOM 348

Time: 10:25 – 10:45 a.m.	Presenter's Name: Heather Imoehl	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-04-12S
Capstone Title: Lashkar-e-Taiba ("Army of the Pure")			

Capstone Abstract:

Lashkar-e-Taiba is a Pakistani based terrorist group committed to waging violent jihad until all Muslim territory is recaptured. The focus of the group for the past two decades has mainly been in the Kashmir region and in India.

The group is primarily known for the 2008 Mumbai attacks, which garnered mass amounts of media attention worldwide and displayed a deliberate attempt of targeting Westerners. While their efforts are still concentrated in Asia, the threat of this group to the United States is still apparent in their willingness to train other terrorist groups as well as in their ability to overtly exist in Pakistan with help from Pakistan's intelligence agency, Inter-Services Intelligence (ISI).

I created a Microsoft Access database containing open-source research related to the group. The purpose of this is to utilize database manipulation to make unknown connections as well as make it accessible for diverse queries. Using the software, Analyst's Notebook, link analysis was also used to show the leadership structure and social network of the group.

Time: 10:50 – 11:10 a.m.	Presenter's Name: Michael Kelly	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-05-12S
External Sponsor: Dustin Razsi, Ph.D.			
Capstone Title: Paper vs. Pixels: How a Switch to Tablet-based Briefing May Affect the Intelligence Process			

Capstone Abstract:

The purpose of this capstone project is to attempt to examine the changes that might be triggered by a shift from book-based briefing to tablet-based briefing in the intelligence community. Specifically, it will look at the briefing system of the Department of Homeland Security's Secretary's Daily Brief (DHS' SDB), which is currently expecting a transition to a tablet-based brief. The predicted changes will include both the immediate, obvious deviations from the traditional style and the long-term implications and opportunities a tablet-based brief will likely yield if the shift is perpetuated. This project will also contain an assessment by the researcher on the recommendation of such a change. In a world of ever advancing technologies, it is critical that each one we employ has been thoroughly examined before completely adopting or discounting it.

LOCATION: ISAT – ROOM 348

Time: 11:15 – 11:40 a.m.	Presenter’s Names: -Andy Bonett-Endara -Brendan Hanrahan	Capstone Advisors: -Dr. Jeffrey Tang -Dr. Michael Deaton	Capstone No.: IA-06-12T
Capstone Title: Venezuela: A futures analysis on the general state of affairs and implications for U.S. security and foreign policy			

Capstone Abstract:

Ever since Hugo Chavez was elected as President of the Bolivarian Republic of Venezuela in 1999, relations with the U.S. have progressively deteriorated. Politically, tensions are as high as ever, although both nations have managed to maintain mutually beneficial economic ties based on the sale and production of oil.

The Chavez regime has aimed to undermine American influence not only in South America, but also in other regions of the world vital to U.S. security interests. This is most evident in Venezuela’s relations with rogue states such as Iran and North Korea. These alliances include several trade and energy agreements, and have often also included weapons sales and joint military exercises and exchanges. Of particular concern is Chavez’s close friendship with Iran’s president, Mahmoud Ahmedinejad.

Chavez has certainly not been shy about publicly supporting a U.S.-designated state sponsor of terrorism. Taking these factors into account, it is relatively easy to see why Venezuela has developed into such an integral element of U.S. national security and foreign policy. The main purpose of this Capstone project is to determine the general state of affairs in Venezuela 10 to 15 years down the road. Through the application of cross-case study analysis, causal analysis, and counterfactual reasoning, future scenarios can be generated to forecast the most likely prospects regarding U.S.-Venezuela relations.

Those that stand to benefit the most from this analysis may include State Department officials, the Drug Enforcement Agency, and various other intelligence community professionals.

LOCATION: ISAT – ROOM 348

Time: 11:45 – 12:10 p. m.	Presenter’s Names: -Scott Garrison -Caroline Merz	Capstone Advisors: -Dr. Jeffrey Tang -Dr. Henry Way	Capstone No.: IA-07-12T
Capstone Title: “Only When the Ice Breaks Will You Truly Know Who Is Your Friend and Who Is Your Enemy”: A Future’s Analysis on the Security Implications of the Disappearing Polar Ice Cap			

Capstone Abstract:

It is widely known that the phenomenon of global warming and global climate change are occurring and having drastic effects on the northern polar ice cap. In coming years the ice cap will have completely disappeared, opening the unknown waters of the arctic. International law currently prohibits any nation to stake claim of the region and all activity has been limited to research and military use. Given these parameters, there will be many implications that the United States will need to consider in coming years. Using a systems dynamic model in conjunction with counterfactual reasoning and thorough GIS analysis, we can project into the future to assess the implications and threats that this event will have. The focus will remain primarily on the bordering arctic countries of Russia, Norway, Sweden, Greenland, Canada, and the United States.

Time: 1:00 – 1:25 p.m.	Presenter’s Names: -Josh Frye -Patrick Mellon	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-08-12T
Capstone Title: Jerusalem -- A Systematic City			

Capstone Abstract:

For millennia there have been conflicts among humans that have brought about oppression and strife. This study focuses on the Israeli-Palestinian conflict with an emphasis on the centrality of Jerusalem.

This study does not aim to offer a definitive solution, but rather to find some ways to alleviate tension within Jerusalem, as it is seen as a starting point for the larger region. Through the examination of case studies, this project hopes to discover opportunities that may carefully guide Jerusalem to become a more unified and cohesive city. The reasoning behind such a shift in Jerusalem is that, as one of the biggest and most symbolic cities in the region, it may be utilized in influencing the greater region to shift toward a more cooperative environment.

Using several analytic tools, including opportunity analysis and especially systems dynamics, the hope is to identify a system within Jerusalem that may have leverage points as possible opportunities to influence change.

LOCATION: ISAT – ROOM 348

Time: 1:30 – 1:50 p.m.	Presenter’s Name: Faris Al-Nsour	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-09-12S
Capstone Title: Lone Wolf Terrorism			

Capstone Abstract:

There is no one single profile that lone wolf terrorist’s will fit into, as a result many different types of violent radicals will fall under the umbrella of lone wolf terrorism. Consequently, counter-terrorism services can better allocate their resources by not only asking who the lone wolf is, but also how they formulate their attacks. The subject is currently commanding increased media attention because of increasing appeals in radical Islamist circles encouraging the individuals to strike out on their own.

Past counter terrorism policies have been successful in hindering right wing radical movement’s ability to operate. Realizing this defeat, these groups began to shift their strategy from an operational capacity to a training/motivational strategy which advocates leaderless resistance. The rise of the internet has allowed likeminded individuals to communicate propaganda and operational knowledge to one another, in the privacy of their own homes.

Time: 1:55 – 2:20 p.m.	Presenter’s Names: -Ryan Gordon -Jimmy Kalina	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-10-12T
Capstone Title: GIS Applications on Mobile Smart Devices for In-Field Data Collection			

Capstone Abstract:

With the rapid development of GIS and the expansion of wireless smart phone and tablet technologies, mobile GIS is becoming an active research area. Data collection is one of the most important applications of mobile GIS, which allows users to perform tasks in the field with higher efficiency and productivity. The purpose of this paper is to study the field of geographical information systems and its advancement on mobile devices by using the GeoRover Mobile Android application developed by Science Applications International Corporation.

LOCATION: ISAT – ROOM 348

Time: 2:25 – 2:45 p.m.	Presenter’s Name: Evan Waranowski	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-11-12S
Capstone Title: The Need For A More Disciplined Understanding and a “Target” Specific Plan for Counter-Measures Against Online Terrorist Recruitment			

Capstone Abstract:

For this project, several of the latest approaches that have been developed for countering the online-terrorist recruitment process will be thoroughly examined and analyzed using critical thinking methodology. Through this process multiple analytic tools that are taught from some of the core classes of the IA program will be used in order to arrive at a conclusion and a solid approach that includes aspects from one or more of the current methods. Expertise in the Arabic language (and other dialects) and the religious culture of the regions pertinent to many of the terrorist recruiter groups homeland’s will help to answer the questions of why and how individuals evolve in the recruitment process, as well as create a better understanding of the content and motives behind the recruiters web sites and their way of thinking. Increased transparency in the behavioral psychology of the process will help advance online terrorism recruitment counter-measure technology, such as those from Rsignia, Inc. (cyber security solutions government contractor), to be implemented for U.S. counter-terrorism organizations.

Time: 2:50 – 3:10 p.m.	Presenter’s Name: Katelyn Bledsoe	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-12-12S
Capstone Title: Analysis of the Haqqani Network			

Capstone Abstract:

The Haqqani Network is an Islamic insurgent organization present in Afghanistan and Pakistan. While the organization has been present for decades, over the past five years the Haqqani Network has caused severe implications for United States foreign policy. By conducting in depth background research and multiple forms of analytical methods, I was able to generate possible opportunities for the United States in effort to counter the Haqqani Network.

LOCATION: ISAT – ROOM 348

Time: 3:15 – 3:35 p.m.	Presenter's Name: Michael Yates	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-13-12S
Capstone Title: Small Arms in West Africa			

Capstone Abstract:

This project is an analysis of the illegal flow of weapons in the region and the problems associated with it. Its roots stem from the colonial "Scramble for Africa" and the negative effects can be seen in the current events of the area. A new system for dealing with the modern day scramble for resources is necessary in order to avoid the mistake of repeating history.

Time: 3:50 – 4:10 p.m.	Presenter's Name: Ashley Mullins	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-14-12S
Capstone Title: Futuristic Analysis of US-Pakistan Relations Within the Next 18 Months			

Capstone Abstract:

A futures analysis of the relationship between Pakistan and the United States, highlighting the possible scenarios for the next 18 months to 2 years, while incorporating the possibility of a single event occurring that has the potential to change the relationship's direction completely. The main driving factors in this analysis are: US funding to Pakistan, US military influence, and political change in Pakistan. While the "single-event factor" will be generated to coincide with a specific scenarios brought about by a combination of the three drivers either increasing or decreasing.

LOCATION: ISAT – ROOM 348

Time: 4:15 – 4:35 p.m.	Presenter's Name: Matt Redabaugh	Capstone Advisor: Dr. Jeffrey Tang	Capstone No.: IA-15-12S
Capstone Title: Cyberterrorism: Serious Threat or Potential Myth?			

Capstone Abstract:

Many analysts and political strategists consider cyberspace as the new frontier for terrorism. Many have mentioned the possibility of a “Cyber Pearl Harbor” and this has caused a surge of government policies and spending on cyber security, even with the introduction of Cyber Command. This project strives to point out the fallacies with many of these arguments. Although cyberterrorism is an issue, the extent to which it is a threat may be exaggerated. Cyber security should focus more on daily cyber breaches that affect our economy, businesses, and individuals (things like phishing and credit card fraud). Cyberterrorism also is typically associated with traditional terrorists (those we’ve seen from Muslim descent) but in reality cyberterrorists would likely be from a different descent, focusing on different issues.