



Department of Integrated Science and Technology

15th Annual

ISAT, GS, and IA Senior Capstone Project Presentation Symposium

Friday, April 15, 2011

ISAT & HHS Buildings

9:00 a.m. – 5:00 p.m.

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ISAT MAJORS – PRESENTERS IN ALPHABETICAL LISTING

LAST NAME	FIRST NAME	PRESENTATION TIME	PRESENTATION LOCATION	CAPSTONE PAGE No.	CAPSTONE ADVISOR
Allen	Brady	2:15-3:15 p.m.	ISAT-Rm 159	26	Dr. Chris Bachmann Mr. Roger Monger
Arrington	William	2:30-3:10 p.m.	ISAT-Rm 148	13	Dr. Geoffrey Egekwu
Ashworth	James	11:00-11:40 a.m.	ISAT-Rm 348	38	Dr. Stephanie Stockwell
Attard	Daniel	1:00-2:00 p.m.	ISAT-Rm 159	25	Dr. Chris Bachmann
Balac	Taylor	2:15-3:15 p.m.	ISAT-Rm 159	26	Dr. Chris Bachmann Mr. Roger Monger
Becker	Jillian	2:30-2:55 p.m.	ISAT-Rm 348	41	Dr. Wayne Teel
Branner	Brad	1:45-2:25 p.m.	ISAT-Rm 348	40	Dr. Wayne Teel
Bucci, Jr.	John	2:00-2:40 p.m.	ISAT-Rm 150	21	Dr. Jonathan Miles
Cardona	Kenneth	11:00-11:40 a.m.	ISAT-Rm 337	29	Dr. Emil Salib
Carwell	Jason	2:00-2:25 p.m.	ISAT-Rm 148	13	Dr. Geoffrey Egekwu
Clark	Stephen	9:00-9:50 a.m.	ISAT-Rm 150	16	Dr. Karim Altaii
Clerico	Kyle	2:15-3:15 p.m.	ISAT-Rm 159	26	Dr. Chris Bachmann Mr. Roger Monger
Collins	Joshua	11:00-11:40 a.m.	ISAT-Rm 337	29	Dr. Emil Salib
Cooke	Libby	11:00-11:40 a.m.	ISAT-Rm 348	38	Dr. Stephanie Stockwell
Copley	Billy	2:15-3:15 p.m.	ISAT-Rm 159	26	Dr. Chris Bachmann Mr. Roger Monger
Deitch	Christina	1:00-1:40 p.m.	ISAT-Rm 348	39	Dr. Wayne Teel
Draper	Bridget	10:00-10:40 a.m.	ISAT-Rm 350	48	Ms. Carollyn Oglesby Dr. Steven Frysinger
Drummond	Kurtis	9:30-10:10 a.m.	ISAT-Rm 348	36	Dr. Robert Brent
Dudley	Jeremy	9:45-10:25 a.m.	ISAT-Rm 337	27	Dr. Emil Salib
Etz	Kristen	4:00-4:40 p.m.	ISAT-Rm 348	44	Dr. Gene Tucker
Ferraro	Andrew	10:30-10:55 a.m.	ISAT-Rm 337	28	Dr. Emil Salib
Fielding	Spencer	10:00-10:40 a.m.	ISAT-Rm 350	48	Ms. Carollyn Oglesby Dr. Steven Frysinger
Foltz	Brandon	9:30-10:10 a.m.	ISAT-Rm 348	36	Dr. Robert Brent
Fox	Jessica	1:30-1:55 p.m.	ISAT-Rm 350	52	Dr. Amanda Biesecker Dr. Jeffrey Tang
Gaertner	Evan	1:30-1:55 p.m.	ISAT-Rm 150	20	Dr. Jonathan Miles
Gazenski	Kimberly	1:00-1:40 p.m.	ISAT-Rm 348	39	Dr. Wayne Teel

Giardino	Tara	10:45-11:10 a.m.	ISAT-Rm 350	49	Dr. Robert McKown
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ISAT MAJORS – PRESENTERS IN ALPHABETICAL LISTING

LAST NAME	FIRST NAME	PRESENTATION TIME	PRESENTATION LOCATION	CAPSTONE PAGE No.	CAPSTONE ADVISOR
Gore	Ellis	1:00-2:00 p.m.	ISAT-Rm 159	25	Dr. Chris Bachmann
Grabau	Andrew	3:30-3:55 p.m.	ISAT-Rm 348	43	Dr. Gene Tucker
Green	Brandyn	2:15-3:15 p.m.	ISAT-Rm159	26	Dr. Chris Bachmann Mr. Roger Monger
Greene	Marshall	1:45-2:25 p.m.	ISAT-Rm 348	40	Dr. Wayne Teel
Hammond	James	10:45-11:25 a.m.	ISAT-Rm 150	17	Dr. Tony Chen
Heintz	Matthew	11:30-12:10 p.m.	ISAT-Rm 150	18	Dr. Anne Henriksen
Hughes	Trey	3:30-4:10 p.m.	ISAT-Rm 150	23	Dr. Jonathan Miles
Hulvey	Isaac	3:45-4:25 p.m.	ISAT-Rm 148	15	Mr. Paul Goodall
Jennings	Rob	2:00-2:40 p.m.	ISAT-Rm 150	21	Dr. Jonathan Miles
Jin	Douglas	1:00-1:25 p.m.	ISAT-Rm 337	30	Dr. Nicole Radziwill
Johnson	Andrew	10:00-10:40 a.m.	ISAT-Rm 350	48	Ms. Carollyn Oglesby Dr. Steven Frysinger
Johnson	Jean	2:45-3:25 p.m.	ISAT-Rm 150	22	Dr. Jonathan Miles Ms. Remy Luerssen
Johnson	William	3:30-4:10 p.m.	ISAT-Rm 150	23	Dr. Jonathan Miles
Jones	Courtney	2:30-3:10 p.m.	ISAT-Rm 337	33	Dr. Morgan Benton
Jones	Michael	4:00-4:40 p.m.	ISAT-Rm 348	44	Dr. Gene Tucker
Kelاهر	Joshua	9:00-9:50 a.m.	ISAT-Rm 150	16	Dr. Karim Altaii
Katich	Robert	1:30-1:55 p.m.	ISAT-Rm 148	12	Dr. James Ridings Dr. Geoffrey Egekwu
Kim	Sol	11:00-11:40 a.m.	ISAT-Rm 337	29	Dr. Emil Salib
Klepper	Alyssa	9:00-9:40 a.m.	ISAT-Rm 337	27	Dr. Emil Salib Dr. Morgan Benton
Knox	Daniel	1:00-2:00 p.m.	ISAT-Rm 159	25	Dr. Chris Bachmann
Kuhnley	Amanda	11:30-11:55 a.m.	ISAT-Rm 148	11	Dr. Ronald Kander Mr. Paul Goodall Dr. Kathryn Stevens
Laub	David	11:15-11:55 a.m.	ISAT-Rm 350	50	Dr. Anthony Teate
Long	Amber	2:30-3:10 p.m.	ISAT-Rm 337	33	Dr. Morgan Benton
Loso	Drew	9:00-10:00 a.m.	ISAT-Rm 159	24	Dr. Chris Bachmann

ISAT MAJORS – PRESENTERS IN ALPHABETICAL LISTING

LAST NAME	FIRST NAME	PRESENTATION TIME	PRESENTATION LOCATION	CAPSTONE PAGE No.	CAPSTONE ADVISOR
Lundstrom	Jeremy	11:15-11:55 a.m.	ISAT-Rm 350	50	Dr. Anthony Teate
Lynch	Adam	9:00-9:25 a.m.	ISAT-Rm 348	35	Dr. Thomas Benzing
Madden	Graham	2:00-2:25 p.m.	ISAT-Rm 337	32	Dr. Morgan Benton Dr. David Bernstein
Martin	Ben	3:00-3:25 p.m.	ISAT-Rm 348	42	Dr. Gene Tucker
Mason	Morgan	9:00-9:40 a.m.	ISAT-Rm 337	27	Dr. Emil Salib Dr. Morgan Benton
Merkel	Matthew	1:30-1:55 p.m.	ISAT-Rm 337	31	Dr. Morgan Benton
Miller	Gregory	2:45-3:25 p.m.	ISAT-Rm 150	22	Dr. Jonathan Miles Ms. Remy Luerssen
Mills	Caroline	10:00-10:40 a.m.	ISAT-Rm 350	48	Ms. Carollyn Oglesby Dr. Steven Frysinger
Moellers	Taylor	1:00-2:00 p.m.	ISAT-Rm 159	25	Dr. Chris Bachmann
Moschopoulos	Constantine	10:00-10:25 a.m.	ISAT-Rm 148	9	Dr. Jeffrey Tang
Murgia	Matthew	9:00-9:50 a.m.	ISAT-Rm 150	16	Dr. Karim Altaï
Murphy	Matthew	1:00-1:25 p.m.	ISAT-Rm 150	19	Dr. Jonathan Miles
Nguyen	An	3:15-3:40 p.m.	ISAT-Rm 337	34	Dr. Anthony Teate
Oliver	Nathan	3:15-3:40 p.m.	ISAT-Rm 148	14	Mr. Paul Goodall
Pearson	Cara	2:45-3:25 p.m.	ISAT-Rm 150	22	Dr. Jonathan Miles Ms. Remy Luerssen
Price	Gregory	1:00-1:25 p.m.	ISAT-Rm 148	12	Dr. Ken Lewis
Pugh	Thomas	3:45-4:25 p.m.	ISAT-Rm 148	15	Mr. Paul Goodall
Rakaric	Robert	9:55-10:40 a.m.	ISAT-Rm 150	16	Dr. Karim Altaï
Ramirez	Ryan	9:30-9:55 a.m.	ISAT-Rm 148	8	Dr. Jeffrey Tang
Randolph	Owen	10:00-10:25 a.m.	ISAT-Rm 148	9	Dr. Jeffrey Tang
Ratliff	Ian	9:45-10:25 a.m.	ISAT-Rm 337	27	Dr. Emil Salib
Reiske	Justin	10:15-10:55 a.m.	ISAT-Rm 348	37	Dr. Robert Brent
Reznick	Max	10:45-11:25 a.m.	ISAT-Rm 150	17	Dr. Tony Chen
Ritchey	Sean	9:45-10:25 a.m.	ISAT-Rm 337	27	Dr. Emil Salib
Robinson	Emily	10:15-10:55 a.m.	ISAT-Rm 348	37	Dr. Robert Brent
Romaniw	Robert	2:15-3:15 p.m.	ISAT-Rm 159	26	Dr. Chris Bachmann Mr. Roger Monger

Rupnik	Bryson	3:30-4:10 p.m.	ISAT-Rm 150	23	Dr. Jonathan Miles
Sabo	James	10:00-10:40 a.m.	ISAT-Rm 350	48	Ms. Carolyn Oglesby Dr. Steven Frysinger
Spurr	Andrew	1:00-2:00 p.m.	ISAT-Rm 159	25	Dr. Chris Bachmann

ISAT MAJORS – PRESENTERS IN ALPHABETICAL LISTING

LAST NAME	FIRST NAME	PRESENTATION TIME	PRESENTATION LOCATION	CAPSTONE PAGE No.	CAPSTONE ADVISOR
Stern	Aaron	9:30-9:55 a.m.	ISAT-Rm 350	47	Ms. Carolyn Oglesby
Sterner	Mark	2:30-3:10 p.m.	ISAT-Rm 148	13	Dr. Geoffrey Egekwu
Stevens	Justin	9:00-10:00 a.m.	ISAT-Rm 159	24	Dr. Chris Bachmann
Thompson	Joshua	9:55-10:40 a.m.	ISAT-Rm 150	16	Dr. Karim Altaï
Trotta	Caitlin	1:00-1:25 p.m.	ISAT-Rm 350	51	Dr. Steven Cresawn Dr. Amanda Biesecker
Wagner	Andrew	9:00-9:25 a.m.	ISAT-Rm 148	7	Dr. Jeffrey Tang
Walker	Jamison	11:30-12:10 p.m.	ISAT-Rm 150	18	Dr. Anne Henriksen
Way	Grayson	2:00-2:25 p.m.	ISAT-Rm 350	53	Dr. Stephanie Stockwell
Weber	Brent	4:45-5:10 p.m.	ISAT-Rm 348	45	Dr. Wayne Teel
Young	Brian	9:55-10:40 a.m.	ISAT-Rm 150	16	Dr. Karim Altaï
Zuk	Derek	9:00-9:25 a.m.	ISAT-Rm 350	46	Ms. Carolyn Oglesby Dr. Steven Frysinger

GEOGRAPHIC SCIENCE PROGRAM

PRESENTERS IN ALPHABETICAL LISTING

LAST NAME	FIRST NAME	PRESENTATION TIME	PRESENTATION LOCATION	CAPSTONE PAGE No.	CAPSTONE ADVISOR
Anhold	Matt	Poster Display	ISAT Main Hallway	61	Dr. A. Goodall
Cumming	Kristen	Poster Display	ISAT Main Hallway	62	Dr. J. Walker
Cummings	Robin	10:00-10:25 a.m.	HHS Room 1202	55	Dr. H. Way
Estep	Cory	9:30-9:55 a.m.	HHS Room 1202	54	Dr. H. Way
Hamm	Charles	Poster Display	ISAT Main Hallway	63	Dr. T Benzing Dr. Z Bortolot
Harter	Christopher	Poster Display	ISAT Main Hallway	64	Dr. Z. Bortolot
Hodges	Matthew	Poster Display	ISAT Main Hallway	64	Dr. C. Nash
Howey	Catherine	Poster Display	ISAT Main Hallway	65	Dr. J. Coffman Dr. J. Wilson
Melton	Daniel	1:30-1:55 p.m.	HHS Room 1202	57	Dr. Z. Bortolot
Montalvo	Anthony	2:30-2:55 p.m.	HHS Room 1202	59	Dr. Z. Bortolot
Roberts	Kathryn	9:00-9:25 a.m.	HHS Room 1202	54	Dr. M. Deaton
Romeo	Lucy	11:00-11:25 a.m.	HHS Room 1202	56	Dr. J. Coffman Dr. J. Gentile
Shunfenthal	Jennifer	3:00-3:25 p.m.	HHS Room 1202	60	Dr. C. Nash
Waters	Eric	2:00-2:25 p.m.	HHS Room 1202	58	Dr. Z. Bortolot

INFORMATION ANALYSIS PROGRAM

PRESENTERS IN ALPHABETICAL LISTING

LAST NAME	FIRST NAME	PRESENTATION TIME	PRESENTATION LOCATION	CAPSTONE PAGE No.	CAPSTONE ADVISOR
Brown	Craig	4:00-4:20 p.m.	ISAT - Room 136	71	Dr. Tang
Buchanan	James	1:15-1:50 p.m.	ISAT - Room 136	68	Dr. Tang
Cho	Gun	12:25-12:45 p.m.	ISAT - Room 136	67	Dr. Tang
Civis	Kathleen	11:30-11:50 a.m.	ISAT - Room 136	66	Dr. Tang Dr. M. Deaton
Folliard	Patrick	1:55-2:15 p.m.	ISAT - Room 136	68	Dr. Tang
Gardiner	Thomas	12:00-12:20 p.m.	ISAT - Room 136	66	Dr. Tang Dr. Hendrickson
Hall	Cory	11:00-11:25 a.m.	ISAT - Room 148	10	Dr. Tang Dr. Newbold
Hickey	Tyler	4:25-4:50 p.m.	ISAT - Room 136	71	Dr. Tang
Jarvis	Chase	3:35-3:55 p.m.	ISAT - Room 136	70	Dr. Tang
Jenkins	Joshua	3:10-3:30 p.m.	ISAT - Room 136	70	Dr. Tang
McGuffey	Erich	2:20-2:40 p.m.	ISAT - Room 136	69	Dr. Tang
Mitchell	Blake	11:00 - 11:25 .m.	ISAT - Room 148	10	Dr. Tang Dr. Newbold
Murphy	Erin	10:30-10:55 a.m.	ISAT - Room 148	10	Dr. Tang
Rundle	Kevin	2:45-3:05 p.m.	ISAT - Room 136	69	Dr. Tang
Shaw	Katie	12:50-1:10 p.m.	ISAT - Room 136	67	Dr. Tang Dr. Flannery Dr. Kolvoord
Siragusa	Brad	1:15-1:50 p.m.	ISAT - Room 136	68	Dr. Tang
Sutherland	Heather	12:50-1:10 p.m.	ISAT - Room 136	67	Dr. Tang Dr. Flannery Dr. Kolvoord
Van Sickler	Michael	1:15-1:50 p.m.	ISAT - Room 136	68	Dr. Tang
White	Erica	4:25-4:50 p.m.	ISAT - Room 136	71	Dr. Tang

Department of Integrated Science and Technology

AGENDA – 2011 Senior Capstone Project Presentations

ISAT - ROOM 148

Track 1

Time: 9:00 - 9:25 a.m.	Project #: ISAT-50-11S
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Presenter: Andrew Wagner
Project Advisor: Dr. Jeffrey Tang
External Sponsor: Rich Madeira, Vice President, Enginuity Energy, LLC

Abstract Title: *Feasibility and Social Analysis of the Implementation of a Mobile Thermal Destruction Unit in Rockingham County, Virginia*

Abstract:

This project was designed to determine if Rockingham County, VA could sustain a Mobile Thermal Destruction Unit (MTDU). Along with determining whether or not Rockingham County, Virginia can sustain such gasification technology, this project was designed to evaluate the social obstacles that could come with such implementation. This analysis also compares and contrasts the social obstacles between the implementation of the MTDU and similar technologies.



ISAT - ROOM 148

Track 1

Time: 9:30 – 9:55 a.m.	Project #: ISAT-10-11S
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Presenter: Ryan A. Ramirez

Project Advisor: Dr. Jeffrey Tang

Abstract Title: *Researching and Implementing a Policy to Promote Sustainable Energy in Virginia*

Abstract:

Policy can heavily influence the adoption of renewable energy and energy efficiency technologies. The goal of this project is to work with members of city government to implement a policy in Harrisonburg that will promote sustainable energy. Local governments are often best positioned to develop and implement innovative policies that can help solve emerging problems in a way that is appropriate for the community. After researching and analyzing several local policy options, Property Assessed Clean Energy (PACE) financing was chosen as a potential policy option for Harrisonburg. With the enabling legislation already passed by the Commonwealth of Virginia, PACE was selected because its efficacy and its political viability in Harrisonburg. Traditional PACE programs function by the locality lending money to property owners for clean energy upgrades. After discussions with a city council member, I decided to propose a commercial PACE program funded by private lenders. Implementing this policy would allow Harrisonburg to serve as a model for other cities around the state.



ISAT- ROOM 148

Track 1

Time: 10:00 – 10:25 a.m.	Project #: ISAT-12-11T
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Presenter: Constantine Moschopoulos, Owen Randolph

Project Advisor: Dr. Jeffrey Tang

Abstract Title: *Government Regulations and Social Context of Organic Food*

Abstract:

This project investigates the regulation, production, and consumption of organic food in America. The organic food industry is the fastest growing sector of the food market in the US, as a result, governmental regulation is an important issue in today's society. There are several agencies, farmers, businesses and individual citizens who deal with organic foods. The functions of these entities and their interaction with one another are other areas of concern. This project aims to specify the current and past regulations placed on organic products, determine what producers and consumers value in organic foods, and analyze surrounding issues relating to the organic food market.



ISAT- ROOM 148

Track 1

Time: 10:30 – 10:55 a.m.	Project #: IA-11-11S
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Presenter: Erin Murphy
Project Advisor: Dr. Jeffrey Tang

Abstract Title: *Water Privatization in Nigeria*

Abstract:

Private sector participation in the water industry remains a source of much debate in many countries around the world. With pressure from the international community, private sector involvement in water supply and sanitation began to take root in developing countries in the 1990s. Despite its large population and growing economy, minimal efforts to privatize water have been made in Nigeria. This presentation will address factors that have been restraining Nigeria from pursuing private sector participation in the water industry. It will also present the benefits as well as the risks facing a private company looking to obtain a contract in Nigeria. Additionally, possible outcomes resulting from privatization of water in Nigeria will be offered.

ISAT - ROOM 148

Track 1

Time: 11:00-11:25 a. m.	Project #: IA-12-11T
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Presenters: Blake Mitchell, Cory Hall
Project Advisors: Dr. Jeffrey Tang, Mr. Ken Newbold

Abstract Title: *Analyzing Cocaine Trafficking and the Impact of Law Enforcement Operations within the Western Hemisphere*

Abstract:

Our project utilizes a systems dynamic approach focusing on the supply chain (production to distribution) of the cocaine industry and the impact these operations have on U.S. security. The production of cocaine is primarily in South America, then transiting through Mexico into the United States. There are three major trafficking routes: Pacific, Central, and Caribbean. These routes will be explored in detail through a presentation of GIS maps and explanation of key geographic elements of the region. We focus on the trafficking aspect and discuss the impact of national and international law enforcement operations on the drug trade. Policy and tactical suggestions are proposed for the United States to take against the growing drug problem and associated societal impact

ISAT- ROOM 148

Track 1

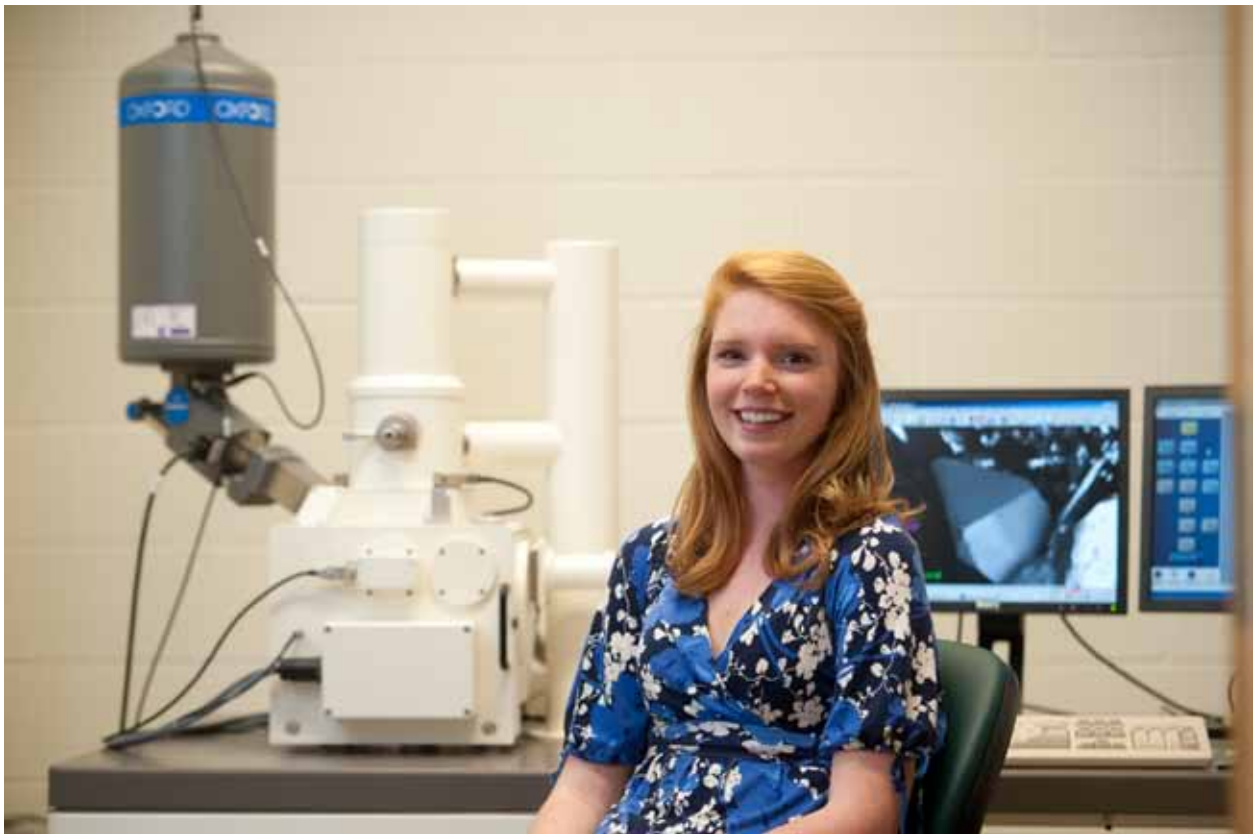
Time: 11:30-11:55 a.m.	Project #: ISAT-48-11S
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Presenter: Amanda Kuhnley
Capstone Advisors: Dr. Ronald Kander, Paul Goodall, Dr. Kathryn Stevens
Honors Capstone: ISAT 499C

Abstract Title: *A New Approach to Materials Education*

Abstract:

A design-led curriculum is the most efficient educational approach to teaching integrated courses, which eliminate academic boundaries and create meaning for enlightened students. A tailored senior ISAT concentration based applied scientific research in the arts exposed the necessity for design-led curriculum in higher education. Material science, which is already a dynamic subject, was the focus of this experiment because of the design-led pedagogy currently being advocated in materials courses by Cambridge professor, Mike Ashby. A material science lab was developed and taught to juniors in the School of Engineering at JMU. The overall success of this experiment was based on student assessments, the breadth of skills that results from the lab exercises, and student reception. The adaptation of a design-led curriculum in a material science course has inspired design-led programs that integrate academic disciplines that are not so dynamic by nature of the subjects. Therefore, this thesis lays the foundation for graduate studies in design-led education and for the future development of an integrated science and art program at James Madison University.



ISAT - ROOM 148

Track 1

Time: 1:00 – 1:25 p.m.	Project #: ISAT – 03-11S
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Presenter: Gregory Price
Capstone Advisor: Dr. Ken Lewis

Abstract Title: *Analyzing Dynamic Biogas Recovery Systems for Agricultural Use*

Abstract:

The objective of this project was to analyze the benefits of implementing a dynamically operating Biogas Recovery System (BRS) in an agricultural setting. In theory, a site at which a system is implemented could operate day to day activity with complete sustainability. Such a system would be fueled by the biogas created in the anaerobic digestion of livestock manure. The biogas would be used generate steam in a simple Rankine cycle, driving a turbine for electrical generation. Unlike large scale electricity generation operating at a consistent output, localized production can benefit from operating dynamically by having the BRS only produce as much power as needed, as most farms and other agricultural entities operate with fairly predictable power demand. A simulation was created to explore the energy saving potential using Matlab® and Simulink®, and then developed into an interactive simulation using LabView 2010®. Optimal dynamic operation was explored by using various feedback algorithms in the simulation model, as well as the effective time response to power demand of various operating methods. Also, a prototype circuit for facilitating the feedback response of an actual BRS was developed, then analyzed and tested for functionality.

Time: 1:30 – 1:55 p.m.	Project #: ISAT-38-11S
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Presenter: Rob Katich

Capstone Advisors: Dr. James Ridings, Dr. Geoffrey Egekwu

External Sponsor: Proconex

Abstract Title: *Application of Process Analysis within Sales & Services*

Abstract:

Process Control & Analysis is a methodology involving statistical and engineering disciplines. It is composed of various mechanisms and algorithms, which control inputs and outputs of a given process. This methodology was utilized at Proconex, primarily a service-oriented process control firm, to assess main areas of focus: efficiency, effectiveness, and utilization. The analysis incorporated tools traditionally utilized in manufacturing processes and applied them to sales and services. Statistical methods and the Information System were used to design management tools revolving around the areas of focus with emphasis on three primary constraints: Quality, Cost, & Scope. A statistical model evaluating customers, as well as employees, based on performance metrics was created. The results were presented in a report format, providing management with statistical assessments of business operations.

ISAT - ROOM 148

Track 1

Time: 2:00 – 2:25 p.m.	Project #: ISAT – 33-11S
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Presenter: Jason Carwell

Capstone Advisor: Dr. Geoffrey Egekwu

External Sponsor: Shawn D. Veer

Abstract Title: *A Computer-Automated Inspection Application in Medical Supply Manufacturing*

Abstract:

This study evaluates the potential usefulness of computer-automated visual inspections as an accurate and reliable alternative to manual inspections of manufactured goods. This study specifically looked at implementing such a system to read printed text used in identification of medical supplies. This system was used in real-time to prevent identification errors in the manufacturing process that would lead to the production of defective products. A systematic approach was used to determine best contrast ratio of printed text on production parts by testing complete product samples under various sections of the light spectrum and filters. Engineers and technicians were consulted to determine optimal system placement to minimize interference with normal operations and minimize defects between production phase and inspection. Different lights and filters provided no benefit on the materials used. Standard fluorescent lighting running semi perpendicular to inspection and already in place was the best choice. Consistent identification was achieved in two thirds of material types. It was determined that vision systems can accurately and consistently identify specific criteria on a product, at least to the same level as the human eye. However, the study shows that a vision system would still not possess the ability to make a “Judgment call”, or rapidly adapt to minor inconsistencies in the manufacturing process. Vision systems can substitute some human inspection, but not all, in this environment.

Time: 2:30 – 3:10 p.m.	Project #: ISAT – 27-11T
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Presenters: William Arrington, Mark Sterner

Capstone Advisor: Dr. Geoffrey Egekwu

Abstract Title: *A More Unified Airline Industry Using Radio Frequency Identification*

Abstract:

Automated Identification (AID) is an essential, in fact necessary, activity in automated processes. The ongoing development and deployment of Radio Frequency Identification (RFID) has facilitated tracking and tracing of items throughout operations and their supply chain. RFID creates a solution that is more preferable to barcode technology because it is more accurate; and it is slowly becoming more affordable. Because of decreasing cost and the effectiveness in the read rates, RFID adoption in commercial airlines/airports operation is beginning to take hold. This project will survey current challenges to a unified system implementation of RFID technologies in the airline industry. An analysis of an RFID system that could be used as the typical system for airlines, including evaluation of implementation costs, will also be presented.

ISAT - ROOM 148

Track 1

Time: 3:15 – 3:40 p.m.	Project #: ISAT – 36-11S
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Presenter: Nathan Oliver

Capstone Advisor: Paul Goodall

Abstract Title: *Entrepreneurship in Energy: Laying the Groundwork for the Establishment of a Residential Energy Audit Business*

Abstract:



The efficient use of energy in buildings is an economically and technologically feasible way to reduce overall energy use as a nation, thereby reducing the associated greenhouse gas emissions, and easing adoption of more renewable sources of energy. To identify the most effective solutions for energy conservation and efficiency in a building, an energy audit should be performed. An energy audit gauges the overall performance of the building envelope, air and thermal barriers, HVAC, water heating, and overall electricity use. The purpose of this project is to lay the groundwork for the establishment of a residential and small commercial building energy auditing business. To achieve this market research was performed and a viable business plan was written. Certification from the Building Performance Institute (BPI) was achieved, and several preliminary energy audits were completed on local residences.

ISAT - ROOM 148

Track 1

Time: 3:45 – 4:25 p.m.

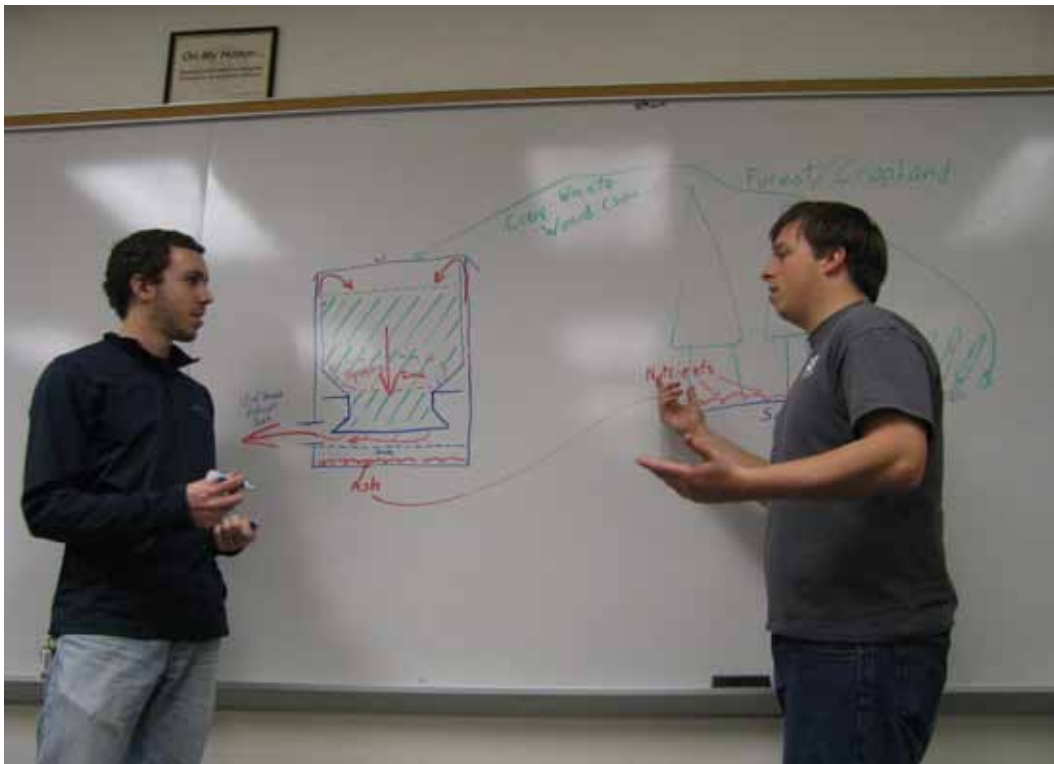
Project #: ISAT – 02-11T

Presenters: Isaac Hulvey, Thomas Pugh
Capstone Advisor: Paul Goodall
External Sponsor: Least of These International

Abstract Title: *Crop Wastes to Bright Lights: Applications of Producer Gas Technology in Developing Countries*

Abstract:

Producer gas is a relatively untouched potential source of renewable energy that is made from the gasification of plant material. Through gasification, hydrogen and other gasses are produced and this mixture functions similarly to natural gas. Producer gas can then ideally be used to provide power and heat to buildings through its combustion. This project's purpose is to prototype a device that can make producer gas from crop wastes and other local organic material. The final goal of this system is a gasifier that can provide a small village electrical power for lights, irrigation, and cooking. The project will also analyze alternatives to the producer gas device for areas where it would be more practical to pursue the use of a different energy source.



ISAT - ROOM 150

Track 2

Time: 9:00 -9:50 a.m.	Project #: ISAT - 17-11T
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Presenters: Stephen Clark, Joshua Kelaher, Matthew Murgia
Capstone Advisor: Dr. Karim Altaï

Abstract Title: *Developing a Photovoltaic Powered Irrigation System*

Abstract:

The objective of this project was to design a system for irrigating water that utilizes photovoltaic panels as the sole source of power. Often, water for agricultural use is transported over distances before its end use. In Iraq, the primary source of power for this process is diesel engines that drive pumps. In effort to revise and improve this approach, the system design uses specifications of an existing orchard in Iraq. The proposed system transports water from the source and to emitters. Design considerations included filtration methods, water storage, optimization of the distribution design, photovoltaic power system design, and total cost. An economic analysis of the discounted payback period was performed. Sensitivity analyses demonstrate that a payback period of 20 years can be achieved.

Time: 9:55 – 10:40 a.m.	Project #: ISAT – 28-11T
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Presenters: Robert Rakaric, Joshua Thompson, Brian Young
Capstone Advisor: Dr. Karim Altaï
External Sponsor: College of Integrated Science and Technology James Madison University Surplus

Abstract Title: *Solar Assisted Light Electric Vehicle (SALEV)*

Abstract:

The purpose of this project was to develop a solar-assisted short-range commuting vehicle capable of all-terrain and all-weather travel. In addition to the original specification, the design was expanded into a three-wheeled recumbent trike style frame capable of transporting two occupants. The solar-assisted light electric vehicle, or SALEV, features an innovative drivetrain which accepts three possible power inputs to one rear wheel (any combination of two human-powered sets of pedals or an electric motor). The solar charging system utilizes an intelligent microcontroller, which decides whether to charge via the wall plug or the sun dependent on conditions for optimized "plug-and-forget" charging operation. The SALEV is the first vehicle of its kind to make use of these innovations and is a concept for future short-range alternative fuel vehicles.



ISAT - ROOM 150

Track 2

Time: 10:45 – 11:25 a.m.	Project #: ISAT – 04-11T
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Presenters: James Hammond, Max Reznick
Capstone Advisor: Dr. Tony Chen
External Sponsor: Dr. Overway

Abstract Title: *System Performance Analysis of a Domestic Solar Hot Water System in Rockingham County, Virginia*

Abstract:

The main objective of this project is to perform a complete analysis on a domestic solar thermal hot water system in Rockingham County, Virginia. The system consists of two racks of evacuated tubes of total 8.32 m² and a closed ethylene glycol (SPP Corn Glycolä) loop. A data logger equipped with a pyronometer and thermistors was used for collecting solar radiation and ambient temperature data and an OMEGAâ eight-channel interface card was used to monitor the energy transfer from glycol tank to the main hot water tank. This project was focusing on understanding the installation and maintenance of such a system in the region along with developing a simulation of a solar thermal system in MATLAB® and Simulink®. Investigation results include solar fraction, system efficiency, and system payback period were determined based on a year-round data and will be presented in order to help determining the feasibility of such systems in the region with the hopes that the solar hot water system for domestic use will become more prevalent in the Shenandoah Central Valley.



ISAT - ROOM 150

Track 2

Time: 11:30 – 12:10 p.m.	Project #: ISAT – 47-11T
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Presenters: Matthew Heintz, Jamison Walker
Capstone Advisor: Dr. Anne Henriksen
External Sponsor: Virginia Clean Cities, Environmental Protection Agency

Abstract Title: *Full Cycle Analysis of Fuel Operated Heater Pilot Study*

Abstract:

This is a pilot project funded by the Environmental Protection Agency to analyze the fuel and cost savings of a specific anti-idling technology: fuel operated heaters. Anti-idling is the concept of using technologies and methods to reduce or eliminate the need to idle engines in vehicles. We determined the effectiveness in saving fuel and reducing emissions made possible by twenty four heaters that were installed in school buses by the use of GPS acquired data. Our results are anticipated to show a significant reduction in fuel costs and emissions over a cold-month period of use of the heaters. Our results should indicate the potential benefit of applying anti-idling technology to diesel engine use of all kinds.



ISAT - ROOM 150

Track 2

Time: 1:00 – 1:25 p.m.	Project #: ISAT – 40-11S
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Presenter: Matthew Murphy
Capstone Advisor: Jonathan Miles

Abstract Title: *Small Wind Training and Testing Facility on JMU Campus*

Abstract:

The Virginia Small Wind Training and Testing Facility (SWTTF) is being developed at James Madison University thanks to a grant from the Commonwealth that was awarded in June 2010. This facility is in development with Facilities Management and the ISAT department leading the effort. It will provide a means to support green workforce development and to conduct increased community outreach with regard to wind energy deployment in Virginia. The facility will also provide a platform for testing new technologies and will serve as an alternative energy showcase for the university. This thesis presents specific details for the project effort including background, scope, design and implementation plans, equipment specifications, and training and testing services to be provided at the facility. The merit of the SWTTF and the services it will provide will help support wind energy projects throughout the region and further propel Virginia as a national leader in sustainable energy development.



Time: 1:30 – 1:55 p.m.	Project #: ISAT – 29-11S
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Presenter: Evan Gaertner
Capstone Advisor: Dr. Jonathan Miles
External Sponsor: Catch the Wind, Ltd., Solaya Energy, LLC

Abstract Title: *Wind modeling and forecasting through advanced data collection techniques in complex terrain in western Rockingham County*

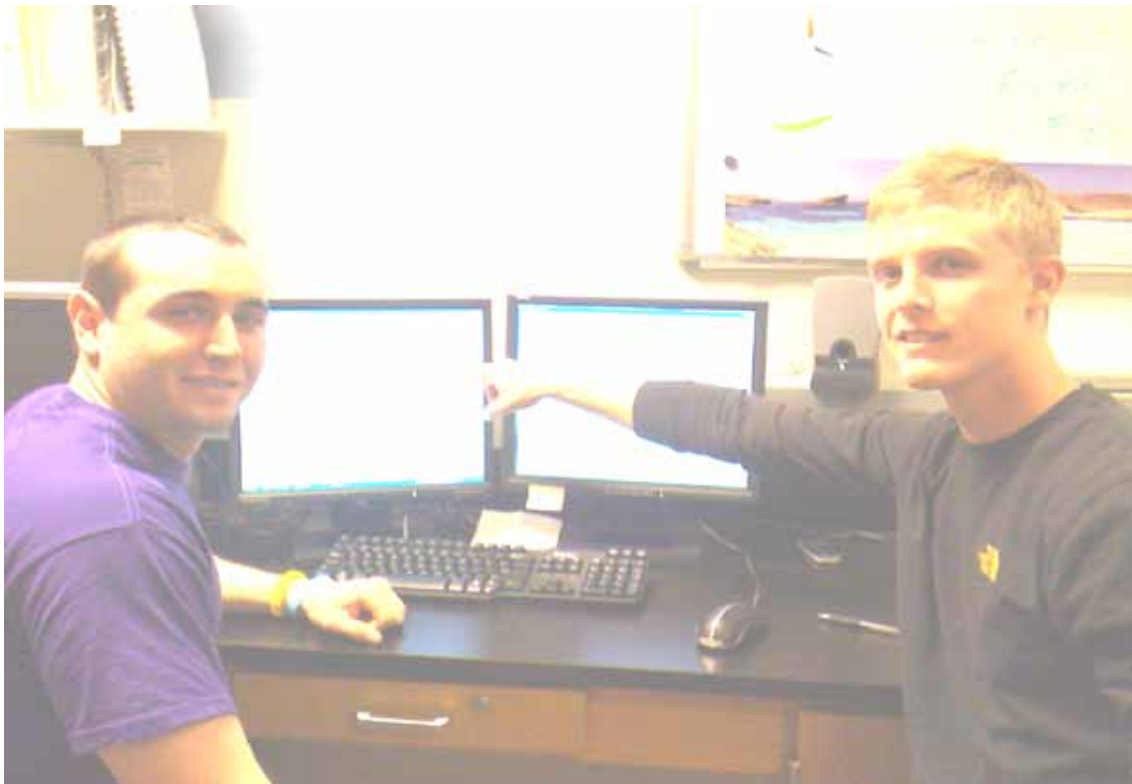
Abstract:

In complex mountainous terrain, wind resource assessment and forecasting is particularly difficult. This project focused on wind modeling and forecasting options available to characterize a ridge line in western Rockingham County. Data were collected using several existing meteorological towers, a sonic detection and ranging (SoDAR) unit, and weather observations from a local airport. Analyses were performed to correlate the observations of the SoDAR unit and an adjacent meteorological tower. A correlation ranging between 0.83 and 0.93 was found depending on the measurement heights of the tower and SoDAR which is consistent with findings of similar studies. WindFarmer and WAsP software packages were used to model the wind resource of the surrounding ridgelines by extrapolated the measurements from a meteorological tower to estimate the potential power production at the site. A short term, high resolution forecasting model was used to predict wind speeds at the site and the time series accuracy of the model was compared to the instantaneous SoDAR measurements. Finally, wind speed ramp events, where there was a sudden and dramatic change in speed, were examined to determine if there was a relationship with ambient weather conditions, especially precipitation.



Time: 2:00 – 2:40 p.m.**Project #: ISAT – 18-11T****Presenters:** John Bucci, Rob Jennings**Capstone Advisor:** Dr. Jonathan Miles**Abstract Title:** *Wind for Schools – Thomas Harrison Middle School, Harrisonburg, VA***Abstract:**

The purpose of this project is to design and develop a plan to implement a small wind turbine at Thomas Harrison Middle School in Harrisonburg, Virginia. The project stems from the Department of Energy funded Wind for Schools Program, through Wind Powering America, which strives to install small turbines at schools and to develop a knowledge base about wind energy for the future. The turbine to be installed will not significantly lower energy consumption at the school, but will act as a hands-on educational tool to integrate wind energy curriculum into the classroom. The major developmental steps that we completed include an energy-use analysis, siting analysis, economics, local issues, and installation logistics. Through support from the Virginia Center for Wind Energy at James Madison University, we created a report that will act as a guide for future Wind for Schools projects in Virginia.



Time: 2:45 – 3:25 p.m.**Project #: ISAT – 06-11T****Presenters:** Cara Pearson, Gregory Miller, Jean Johnson**Capstone Advisors:** Dr. Jonathan Miles, Ms. Remy Luerssen**Abstract Title:** *Wind for Schools – Woodstock, VA***Abstract:**

The Wind for Schools Program is a Department of Energy funded program that is being administered in 11 states around the US. The Wind for Schools Senior Project is designed to allow students to use the skills acquired in the ISAT program to support integration of wind technology into kindergarten through high school classrooms and to gain important research experience in the process. We provided technical assistance to a science teacher at Central High School in Woodstock, Virginia to develop a small wind project on their campus. Working with our advisors as well as an installer from Baker Renewable Energy, we engaged in siting activities, permitting discussions, conducted wind resource and economic analysis, and assisted with fundraising and community engagement to make this project a reality. Through our analysis we determined that with the wind resources available in Woodstock, installing a Skystream 600, a 2.4 kW wind turbine, will generate a small amount of electricity. More importantly, it will provide educational value to students and raise awareness of wind energy as a renewable energy source throughout Shenandoah County.



Time: 3:30 – 4:10 p.m.	Project #: ISAT – 49-11T
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Presenters: Trey Hughes, William Johnson, Bryce Rupnik
Capstone Advisor: Dr. Jonathan Miles
External Sponsor: Sustainable Energy Development, Inc.

Abstract Title: *Assisting the Development Phase of a Community Scale Wind Turbine in Tangier Island, VA*

Abstract:

The purpose of this study was to conduct an appropriate set of wind power siting activities in order to support the development and construction of a 100-kW wind turbine for community application on Tangier Island, a small island community in roughly the geographic center of the Chesapeake Bay. The town of Tangier was awarded in 2010 a \$1 million grant to install a wind turbine. Our team worked directly with Sustainable Energy Development, Inc. and assisted them with the various steps involved in siting the turbine and preparation for installation. The specific tasks include wind data analysis, mapping and measurements, analysis of potential avian issues, visual impact assessment, and permitting. The specific turbine to be installed is the Northwind 100 and has a nameplate generation capacity of 100 kW, hub height of 37 meters, and rotor diameter of 21 meters. This project will reduce the electrical energy imported from the mainland with subsequent economic benefits. This effort will also expose new economic development opportunities for this small fishing community and potentially lead to the development of a new industry on Tangier.



Time: 9:00 – 10:00 a.m.**Project #: ISAT – 16-11T****Presenters:** Drew Loso, Justin Stevens**Capstone Advisor:** Dr. Christopher Bachmann**Abstract Title:** *Electric Truck Conversion for JMU Facilities Management***Abstract:**

The United States is by far the world's leader in petroleum consumption, a resource which will soon come to an end. The way we use oil in the United States must change to adapt to this decreasing oil supply. However, the majority of the country is resistant to change the way we consume energy. If we are to make the necessary technological changes before it is too late, public education and awareness of the global fuel situation must become a high priority. The transportation sector is the largest consumer of petroleum products in the United States. Alternative fuels offer a solution to decreasing our dependence on oil. In particular, electric vehicles offer great promise as they use absolutely no oil and have zero emissions if they are used in conjunction with alternative energy sources, such as wind, solar, or hydro-electric. Our senior thesis project addresses both the potential to introduce electric vehicles in the U.S. in the near future and the public education and awareness necessary to make a nationwide change. To explore the potential of electric vehicles in the United States, we converted a James Madison University service truck into a fully electric, battery powered vehicle for campus maintenance use. With the knowledge that auto technicians and the general public need to better understand the new technology of the future, we have implemented a partnership with the JMU auto-technicians while working side by side in a living-learning laboratory. This is the first step of transforming ideals and minds towards the ever growing field of alternative energy.



Time: 1:00 – 2:00 p.m.	Project #: ISAT – 20-11T
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Presenters: Daniel Attard, Ellis Gore, Daniel Knox, Taylor Moellers, Andrew Spurr
Honors Capstone: Ms. Taylor Moellers, ISAT 499C
Capstone Advisor: Dr. Christopher Bachmann
External Sponsor: Virginia Clean Cities

Abstract Title: *Hydrogen Demonstration for Public Education and Outreach*

Abstract:

The transportation sector accounts for approximately 27% of the total energy consumption in the United States. The majority of that energy comes from petroleum, a polluting and economically volatile fuel. Hydrogen has the ability to provide renewable and secure energy for the U.S. transportation sector. The overall objective of this project is to develop a comprehensive educational demonstration that can be used to inform the public of the potential for hydrogen as an alternative transportation fuel and in stationary applications. To accomplish this, a battery powered scooter was converted to run on a hydrogen fuel system. This was achieved using a hydrogen fuel cell, which generates an electric current and produces water and heat as its only byproducts. Currently there is no economically and environmentally responsible way to produce hydrogen. As an alternative to current production methods, a prototype microbial electrolysis cell was developed to demonstrate sustainable hydrogen production. This method utilizes carbohydrate-rich wastewater and a mixture of different strains of *Geobacter* to produce hydrogen. Ongoing participation in educational events, including National AFV Day Odyssey, the USA Science and Engineering Festival, and the Hydrogen Seminar for Decision Makers, is aimed to promote investment in hydrogen research and development.



Time: 2:15 – 3:15 p.m.	Project #: ISAT – 42-11T
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Presenters: Brady Allen, Taylor Balac, Kyle Clerico, Billy Copley, Brandyn Green, Robert Romaniw

Capstone Advisors: Dr. Christopher Bachmann, Mr. Roger Monger

External Sponsors: Miller Coors, Shenandoah Harley Davidson, Valley Precision Machine Shop

Abstract Title: *American Motorcycle, American Fuel*

Abstract:

The need for renewable energy is growing exponentially. Oil remains the driving factor behind our global economy, and its dwindling supply is serious. In the U.S., ethanol has been introduced as an alternative to gasoline. In comparison, ethanol burns cleaner, has a positive energy balance, and is renewable. Though ethanol is an alternative to gasoline, it isn't the answer to our fuel problems; it is primarily made from corn which has a negative impact on food supplies. Due to this, cellulosic ethanol is currently being researched and the expectation is that its implementation will increase over the next decade. This is dependent, however, on overcoming significant hurdles in the processing cellulosic feedstock. The need for constant development of efficient transportation and energy conservation practices is still necessary. Public education about the global oil supply, it's inevitable depletion, and the environmental impact of fossil fuels is essential to the transition to better forms of energy. Our solution lies in adapting energy efficient transportation to run efficiently on ethanol produced from industrial waste-water. Hence, by partnering with Harley-Davidson and Miller-Coors to develop a motorcycle that runs on clean, renewable fuel, we will attract the interest of the American public."



ISAT - ROOM 337**Track 4**

Time: 9:00 – 9:40 a.m.	Project #: ISAT – 35-11T
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Presenters: Alyssa Marie Klepper, Morgan Margaret Mason**Capstone Advisors:** Dr. Emil Salib, Dr. Morgan Benton**Abstract Title:** *The Use of Electroencephalogram Technology to Harness Brain Waves that Signal Motion to Control an External Computer Application***Abstract:**

This project tested the ability of EEG, electroencephalogram, technology to observe different brain waves and distinguish those brain waves that signal motion of the body. Once these signals were recognized, they were used to control an external computer program. By using facial movements (ie, eye movements) the headset picked up on these signals and sent them to the PacMan program on the computer allowing us to direct the PacMan, up/down/right/left in the game. This program, while seemingly simple, can be used for further development to even control the motion of a powered wheel chair. This technology would be fun for those who have full use of their bodies, and extremely beneficial to those who do not.

Time: 9:45 – 10:25 a.m.	Project #: ISAT – 34-11T
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Presenters: Jeremy Dudley, Ian Ratliff, Sean Ritchey**Capstone Advisor:** Dr. Emil Salib**Abstract Title:** *Networked Home Power Consumption Monitoring and Auditing System***Abstract:**

Do you know how much running your coffee maker cost you last month? How about your television? You've reduced how much you pay for your monthly power bill, but it's still too high and you want to find more ways to decrease your power consumption. The key is seeing exactly which devices in your home are costing you and how much power each is consuming. We made this possible with a networked home power consumption monitoring and auditing system. Because the system communicates through the power line, installing it is as simple as plugging it in! This system uses current sensors to gather



information about the power usage of connected electrical devices. The sensors transfer this information in real time to a central storage device through a power line network. The power monitoring and auditing software developed by this team runs on a PC and is able to show device power usage graphs and the cost of running each device. The software application, however, does not need to be running to monitor and audit the power usage. The devices are able to do this in the background and update the software application whenever it's launched.

ISAT - ROOM 337

Track 4

Time: 10:30 – 10:55 a.m.	Project #: ISAT – 21-11S
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Presenter: Andrew Ferraro

Capstone Advisor: Dr. Emil Salib

Abstract Title: *WiMAX Proposal*

Abstract:

The telecommunications field constantly evolving. One of the newest changes is 4G. This technology can be broken into separate subcategories; the one I am focusing on is WiMAX. WiMAX stands for Worldwide Interoperability for Microwave Access. This is a wireless transmission of data at high speeds over large distances. The WiMAX technology will play a large role in telecom in the coming years, and this is why I have chosen to write a proposal to bring WiMAX to JMU. I am writing this proposal with the purpose of bringing a WiMAX network to JMU for commercial use by faculty and students, as well as a laboratory use for Telecom related classes.



Time: 11:00 – 11:40 a.m.**Project #: ISAT – 14-11T****Presenters:** Joshua W. Collins, Kenneth J. Cardona, Sol Kim**Capstone Advisor:** Dr. Emil Salib**Abstract Title:** *Cellular on Wifi: Dead Zone Solution***Abstract:**

The purpose of this project was to develop a wireless system that would alleviate so called cellular "dead zones". In order to do so a system was developed using WiFi, specifically a Wireless Local Area Network (WLAN), connected to a computer operating as a Private Branch Exchange (PBX) through use of the Linux operating system known as Asterisk. Calls were made using a cell phone using the Android 2.2 operating system running the application CSipSimple, which allowed calls to be made using the Session Initiation Protocol (SIP). An Internet Protocol (IP) phone was connected directly to the PBX as well as the Public Switch Telephone Network (PSTN). Through use of bridging, the Android cell phone was able to make calls while roaming between two access points to both the IP phone as well as make calls to the PSTN, and vice versa. The result was a cell phone that, when not within range of its primary cellular wireless network, could still be make calls to and from the device as well as the ability to roam between access points seamlessly.



Time: 1:00 – 1:25 p.m.	Project #: ISAT – 08-11S
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Presenter: Douglas Jin
Capstone Advisor: Dr. Nicole Radziwill

Abstract Title: *An Expert System for Creating Quality Management Systems*

Abstract:

A Quality Management System (QMS) provides the structure, procedures, processes, and tools needed to achieve quality related goals that are unique to an organization. Organizations with a QMS have a competitive advantage over others based on customer satisfaction, business efficacy, and overall organizational improvement. Because there are a multitude of tools and techniques that can be used to design and deploy a QMS, it can be difficult for an organization to select the most appropriate approach. An expert system was designed to solve this problem, giving organizations access to an interactive and easy to follow tool for implementing a QMS. It specifically recommends what aspects of various quality systems to use, what methods to apply to which processes, and what quality tools to utilize. The expert system is based off of the Quality Systems Development Roadmap (QSDR) published in Quality Progress in 2008.



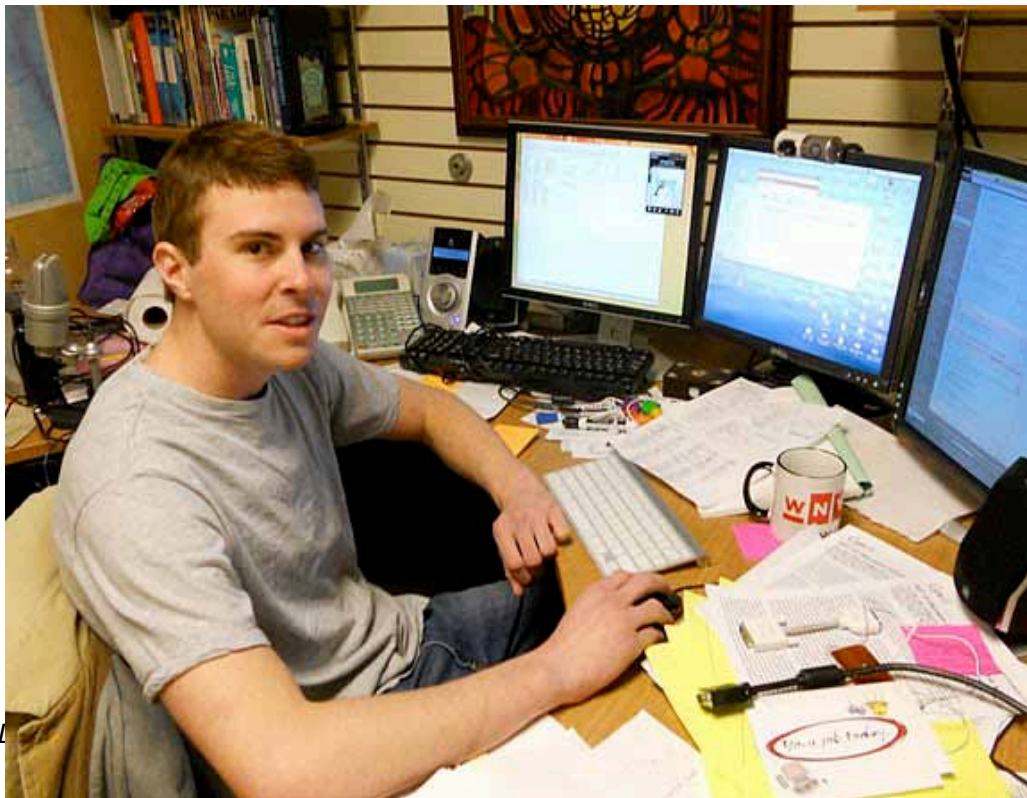
Time: 1:30 – 1:55 p.m.**Project #: ISAT – 24-11S**

Presenter: Matthew Merkel
Capstone Advisor: Dr. Morgan Benton

Abstract Title: *Development of a Residential Site Assessment and Economic Feasibility Calculator for Solar Thermal Systems in Virginia*

Abstract:

This project developed and implemented a public domain, web-based site feasibility analysis tool for residential solar water heating systems. The tool is designed as a site pre-screening/suitability calculator for Virginia homeowners, and enables them to assess the technical and economic feasibility of solar water heating for a household. Ideally, it is meant to be used before engaging in costly and time consuming site characterization and analysis. The tool geographically locates the solar radiance at the user's household from a National Renewable Energy Lab (NREL) Solar database. After obtaining a few inputs from the user, we are able to calculate a hot water system size estimate to meet their hot water needs. Next, the application recommends a commercial system from local vendors that are most alike to the calculated size estimate. Finally, an economic cost analysis of the recommended system is given to give the user an idea of how long it would take for the system to pay for itself.



Time: 2:00 – 2:25 p.m.**Project #: ISAT – 30-11S****Presenter:** Graham Madden**Capstone Advisors:** Dr. Morgan Benton, Dr. David Bernstein**External Sponsor:** Least of These International**Abstract Title:** *Mobile Assessment Tool for Water, Sanitation and Household Energy Technology Selection in Developing Countries***Abstract:**

An estimated 2.6 billion people are without improved sanitation and roughly 1 billion people are without improved drinking water. Of the projects that attempt to correct the deficiencies within community water systems, over 50% fail within the first few years of implementation and less than 1% are monitored in the long term. Least of These International (LOTI) is a non-profit organization whose mission is to “meet the basic needs of rural communities in developing countries through the use of appropriate and sustainable technologies, partnering with grassroots organizations, and research and development into innovative solutions.” The organization was conceived by Reed Barton and Justin Henriques, who are both graduates of the Integrated Science and Technology program. Although there are many views on what constitutes a basic need, LOTI currently focuses on three: water, sanitation, and household energy. An iOS application was developed in partnership with Least of These International to aid its analysts in the assessment of communities and selection of technologies that best meet each community’s specific needs. The organization hopes that such an application will streamline the assessment process as



well as reduce the amount of time necessary to complete their analyses in the field.

ISAT - ROOM 337

Track 4

Time: 2:30 – 3:10 p.m.	Project #: ISAT – 39-11T
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Presenters: Courtney Jones, Amber Long
Capstone Advisor: Dr. Morgan Benton
External Sponsor: Harrisonburg – Department of Public Transportation

Abstract Title: *Harrisonburg – Department of Public Transportation Itinerary Planner*

Abstract:



An online itinerary planner for the Harrisonburg Department of Public Transportation bus system was built to address a common student problem - what bus to take from where and when? Dijkstra's shortest path algorithm was used in conjunction with a database of HDPT bus routes and stops to calculate the best itinerary. Technologies used included, Microsoft ASP.NET MVC 2 Framework and SQL Server. JMU community members do not ride the bus enough because the bus schedules are cumbersome, confusing to use and not in a digital format. It is hoped that the resulting website can have a positive impact on HDPT utilization and thereby the environment.

Time: 3:15 - 3:40 p.m.	Project #: ISAT - 23-11S
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Presenter: An Nguyen
Capstone Advisor: Dr. Anthony Teate

Abstract Title: *Asset Tracking Through the use of Radio Frequency Identification*

Abstract:

The management of assets is fundamental for any organization; whether it be a large corporation, small business, non-profit institution, government agency, or university. The successful management of assets can save an organization time, money, and reduce general management problems. Organizations need to keep track of assets that are often lost or stolen, that are underutilized, or that are hard to locate at the time they are needed. Many organizations have found the remedy for this problem by incorporating Radio Frequency Identification (RFID) technology into their asset management systems. RFID has been around for decades. Only recently, however, has the convergence of lower cost and increased capabilities moved the technology into mainstream applications. The objective of this project is to develop a SQL Server database driven RFID Lab Equipment Tracking System to monitor the movement and locations of high-value laboratory equipment. A .NET website will be developed to allow a lab resource manager to easily identify the location of any tagged equipment, and determine who is currently responsible for that asset. The design and method of this system can be used as a guide for JMU or any other University that wishes to track or

current
future
assets.



Time: 9:00 – 9:25 a.m.**Project #: ISAT – 19-11S****Presenter:** Adam Michael Lynch**Capstone Advisor:** Dr. Thomas Benzing**Abstract Title:** *A Plan for the Restoration and Revitalization of East Campus Creek***Abstract:**

James Madison University's East Campus Creek, a tributary of Blacks Run and part of the greater Chesapeake Bay watershed, has become degraded as a result of channel reconstruction and watershed alterations. Decades of human modification have rendered this creek highly unstable, leading to greater flash flood risk, loss of ecological habitat, and uncontrolled erosion. This study collected and analyzed data



on the current condition of the stream channel and land cover in its watershed to produce a plan for returning the creek to a healthy and sustainable form. Rainfall and storm flow measurements were used to evaluate flood response. Morphological characteristics taken from an upstream reference reach were used to classify the stream. A geographic information system was used to model soil data collected from riparian areas. The data analysis revealed that the creek is a degraded B5 stream that is highly prone to flash floods with a lag time of 4.2 hours. Soils data revealed the existence of alluvial soils surrounding the channel that should be favorable for productive plant growth. The conceptual design for the stream restoration includes channel restructuring and riparian plantings, as well as guidelines for ongoing maintenance and monitoring of the stream.

ISAT - ROOM 348**Track 5**

Time: 9:30 – 10:10 a.m.	Project #: ISAT – 32-11T
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Presenters: Kurt Drummond, Brandon Foltz
Capstone Advisor: Dr. Robert Brent
External Sponsor: DuPont Corporate Remediation Group

Abstract Title: *Impacts of Waynesboro Wastewater Treatment Plant Renovations on Nutrient Levels, Periphyton, and Mercury Uptake in the South River*

Abstract:

Nutrients such as phosphorus and nitrogen are necessary to support the natural ecological functions in a river system. When excess nutrients are loaded into a watershed they, however, can spur algal growth and subsequently deplete the oxygen supply that is necessary for aquatic life. These nutrients are specifically a problem to the health and quality of the Chesapeake Bay watershed. In 2008 the Commonwealth of Virginia instituted regulations to reduce nutrient inputs to the watershed from point sources. To meet these new requirements the municipal wastewater treatment plant in Waynesboro, Virginia underwent major renovations to their processes and treatment capabilities. This study was conducted to evaluate the impact of these upgrades on the South River. Periphyton biomass, nutrient levels, water quality parameters, total and methyl mercury were measured at four locations during two six week periods before and after the renovations were completed. The study showed that the upgraded treatments greatly reduced nutrient point source discharges into the South River.



ISAT - ROOM 348

Track 5

Time: 10:15 – 10:55 a.m.

Project #: ISAT – 09-11T

Presenters: Emily Robinson, Justin Reiske
Capstone Advisor: Dr. Robert Brent
External Sponsor: Virginia Department of Environmental Quality

Abstract Title: *Ecological Effects of Flood Control Dams in Virginia's Ridge and Valley Ecoregion*

Abstract:

The impacts of dams on downstream benthic macroinvertebrate communities is a topic that has not been greatly studied. There are more than 1,600 man-made reservoirs in Virginia, and the Virginia Department of Environmental Quality does not routinely measure the water quality or ecological health of waterways directly below these dams. The purpose of this project was to investigate ecological effects of dams in relatively pristine areas. Benthic macroinvertebrate communities, water quality, and habitat conditions were sampled above and below four dams in Virginia. This was done using the Virginia Department of Environmental Quality methods for stream quality assessments. Samples were collected and subsampled, and the organisms were identified in order to evaluate the impairment of the stream location using the VADEQ Stream Condition Index metric calculations. At three of the four dams, ecological health decreased below the dam and then began to recover further downstream. Stream Condition Index scores decreased by 7.9-24.8% below the three dams. Water chemistry, habitat, and community structure data indicate that

the cause of this impairment may be due to issues with sediment and flow, as well as other factors such as algae growth.



ISAT - ROOM 348

Track 5

Time: 11:00 – 11:40 a.m.	Project #: ISAT – 15-11T
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Presenters: James Ashworth, Libby Cooke

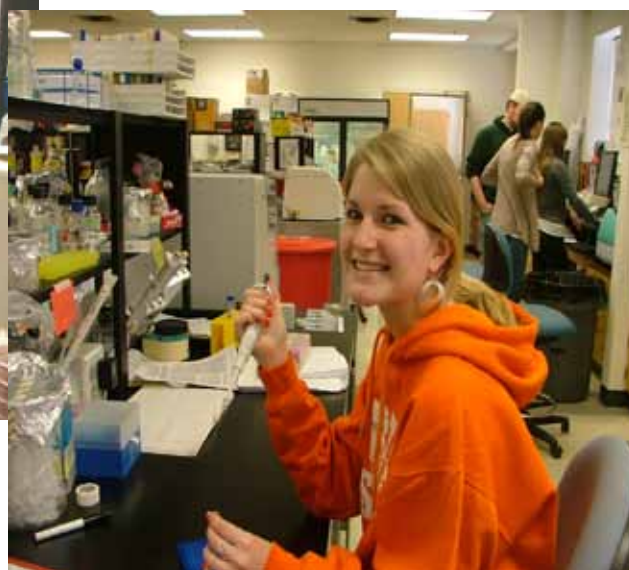
Project Advisor: Dr. Stephanie Stockwell

Abstract Title: *Development of a Multivalent Heterologous Bordetella avium and Hemorrhagic Enteritis Virus Live-Attenuated Vaccine for use in Poultry*

Abstract:

Diseases in commercial poultry represent a significant problem in regard to agriculture and human health. Two pathogens of particular interest are *Bordetella avium* and hemorrhagic enteritis virus (HEV). *B. avium* is a Gram negative bacterium that infects the upper respiratory tract of turkeys and chicken. HEV is a zoonotic adenovirus that infects the gastrointestinal tract of a variety of species. Vaccines are currently available for these diseases, but are relatively ineffective. This research marks the initial steps in creating a multivalent vaccine for both pathogens. The vaccine will comprise of live *B. avium* cells expressing the HEV hexon capsid protein. Proper cellular location and folding of the hexon protein in *B. avium* requires that it be translationally fused to an endogenous *B. avium* surface protein and coexpressed with its viral

chaperone, the 100 kDa protein. Thus, the hexon and 100 kDa genes will be fused to HagB and HagA, both known to be expressed and surface localized in *B. avium* cells *in vivo*. In-frame gene fusions were created via overlap extension polymerase chain reaction. Fused amplicons were cloned and sequenced. Ultimately the fusion genes will be expressed in *B. avium* and tested in turkeys for immunogenic and protective properties.



ISAT – ROOM 348

Track 5

Time: 1:00 – 1:40 p.m.	Project #: ISAT – 01-11T
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Presenters: Christina Deitch, Kimberly Gazenski

Capstone Advisor: Dr. Wayne Teel

Abstract Title: *Biochar Production and Heat Capture: Refining The Design of a Small Scale Production System*

Abstract:

This project consisted of design improvements and further testing of a biochar production system. Biochar is charcoal used to improve soil quality by increasing its ability to store water and nutrients. Its porous structure is created when biomass is heated in the absence of oxygen, a process called pyrolysis. The heating produces off gases like hydrogen, carbon monoxide, and methane, which are burned to further drive pyrolysis. In addition, this process can also potentially sequester carbon if done correctly. Improvements to the design of the system include a stable frame, a hinged door, and an improved heat capture system. The goals of this project were to efficiently create biochar, capture excess heat in the water tank and walls of the system, and measure that heat. Temperature data was analyzed to better characterize

the production process. This system is intended to eventually be a product farmers can buy to produce biochar and heat their greenhouses.



ISAT - ROOM 348

Track 5

Time: 1:45 – 2:25 p.m.

Project #: ISAT – 26-11T

Presenters: Brad Branner, Marshall Greene

Capstone Advisor: Dr. Wayne Teel

External Sponsor: Yellow Cab Inc., Dennis Stoneburner, Marlan Showater, Rockingham Co-op, Gary Biller, Dr. Michael Deaton

Abstract Title: *Biochar Field Trials in a Symbiotoc Polyculture*

Abstract:

With increased interest in alternative agriculture, environmentally beneficial technologies, such as biochar, are gaining attention for the many potential benefits such as carbon sequestration and improved soil nutrient management. For this thesis, biochar was studied as an independent soil amendment and in combination with one of three common nutrient sources. Two types of biochar were tested. Type one was

pyrolyzed by the ISAT Biochar Team from wood scraps, while the second type was made from chicken litter, a plentiful resource in the Shenandoah Valley. The experimental plots were arranged in a complete randomized block design and planted in the symbiotic Three Sisters style using field corn, pole beans, and winter squash. This arrangement was chosen to evaluate biochar's effects in a symbiotic polyculture rather than conventional monocultures used in most prior biochar research and modern agriculture. The reality of an unprotected, small scale polycrop plot is that it is more difficult to maintain adequate populations of each crop for accurate, reliable data. Despite this, we saw lower crop quality and yield in chicken biochar plots when compared to wood biochar plots.



ISAT - ROOM 348

Track 5

Time: 2:30 – 2:55 p.m.	Project #: ISAT – 25-11S
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Presenter: Jillian Becker
Honors Capstone: ISAT 499C
Capstone Advisor: Dr. Wayne Teel

Abstract Title: *The Characterization of Locally Produced Biochars for use as an Agricultural Amendment*

Abstract:

Substantial research has been conducted on biochar in recent years. This charred biomass can be used as a natural soil amendment because of its many properties that are beneficial to different types of soil. The purpose of this project was to characterize eight different sources of biochar based on these properties in order to determine which types of soil they would best amend. Such a characterization scheme does not yet exist, and would facilitate interested parties in selecting a suitable biochar for small- or large-scale

agriculture. A battery of tests was performed on bone, poultry litter, Johnson grass, yellow pine, black walnut, bamboo, miscanthus, pine and cedar chars to determine some of their helpful properties. pH, residual carbon, nutrient content, ash content, and density tests were all performed on these char types and their results compared. Data was collected on these biochars and significant differences were found between categories of biochar. Wood biochars showed similar, moderately low densities and tended to be neutral to slightly acidic. The grass biochars were highly friable and were more basic. The bone and poultry litter chars were much denser with significantly different properties from the rest of the chars.



ISAT - ROOM 348

Track 5

Time: 3:00 – 3:25 p.m.	Project #: ISAT – 31-11S
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Presenter: Ben Martin
Capstone Advisor: Dr. Gene Tucker
External Sponsor: U.S. Geological Survey

Abstract Title: *The Use of Ozone to Oxidize Iron, Aluminum, and Manganese at Realistic Concentrations Found in Acid Mine Drainage*

Abstract:

Metals found in acid mine drainage can be difficult to remove from the highly acidic water that drains from active and abandoned mines. The pilot-scale system housed at JMU, and designed by the USGS, may be capable of removing some metals found in acid mine drainage. This system uses ozone to oxidize metals at lower pH allowing for the particles to be filtered or settled out of the water. Previous research conducted with this pilot-scale system involved the use of only one metal at a low concentration. This research is being conducted on high concentrations of iron and aluminum, and a nominal concentration of manganese that more accurately represent actual acid mine drainage. The results of this research will help understand the way the system reacts when treating acid mine drainage. The hope is that the results of this research, along with other research, will help improve the system and make the system commercially viable.



ISAT - ROOM 348

Track 5

Time: 3:30 – 3:55 p.m.	Project #: ISAT – 37-11S
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Presenter: Andrew Grabau
Capstone Advisor: Dr. Gene Tucker
External Sponsor: U. S. Geological Survey

Abstract Title: *Improved Reactor Design for Heavy Metal Removal Using Ozone*

Abstract:

Due to its association with low pH and high concentration of heavy metals, acid mine drainage poses both an environmental and human health concern. Currently, a process involving the use of ozone to precipitate and remove heavy metals from AMD is being pursued, using a pilot plant and methodology developed by the U.S. Geological Survey and James Madison University. Although previous research performed at the pilot plant has shown promise for the use of ozone in removing manganese and iron, the economic viability of the current reactor design is shadowed in doubt, as removing the precipitated metals requires the use of very fine (0.2-0.45 μm) filters. It is believed that part of the reason for the small size of the resulting particles lies in high shearing forces present in the current reactor design. To resolve this, a new reactor design was developed and evaluated. A lab-scale replica of the pilot plant was constructed, and the new reactor (using a plug flow design) was tested using manganese sulfate. Several modifications were made to the reactor throughout the development process, and the new reactor shows promise, forming larger settleable particles.



ISAT - ROOM 348

Track 5

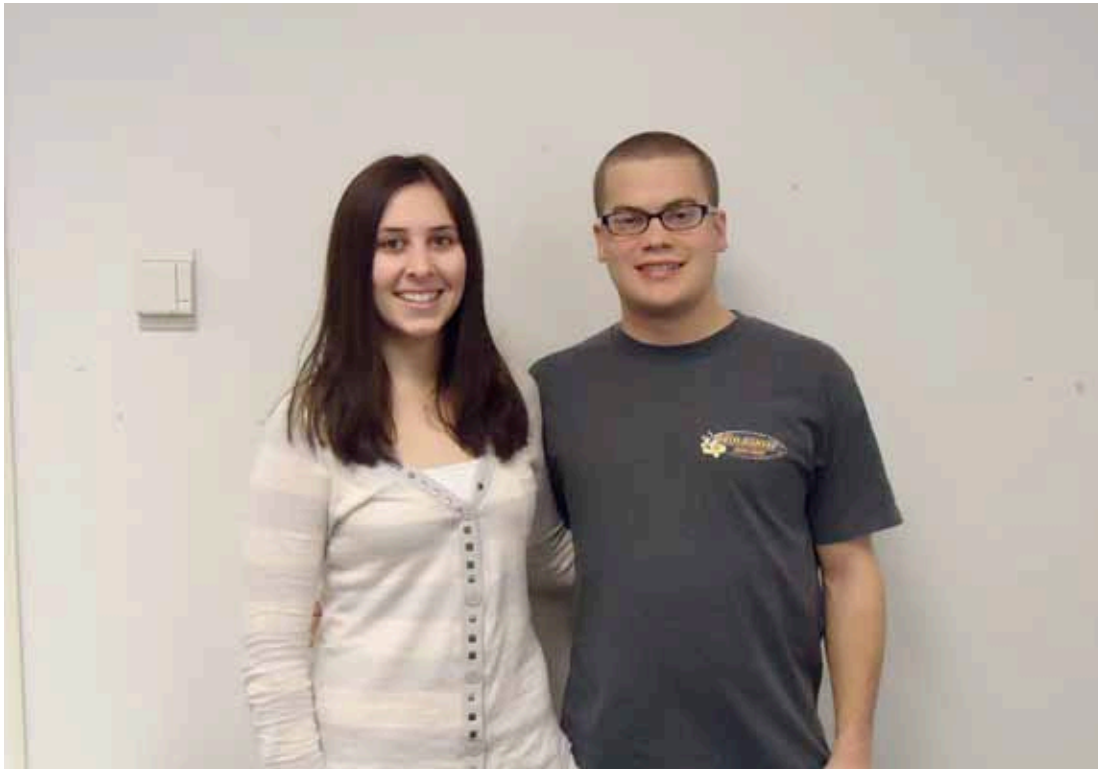
Time: 4:00 – 4:40 p.m.	Project #: ISAT – 07-11T
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Presenters: Krissy Etz, Mike Jones
Capstone Advisor: Dr. Gene Tucker
External Sponsor: Least of These International

Abstract Title: *Streamlining a Community Assessment for a Sustainable Drinking Water Technology*

Abstract:

Clean water is still a major issue in developing countries. Even in the 21st century people are lacking access to safe or even improved drinking water sources. It has been estimated that over 50% of water systems fail. To help combat this high failure rate, it is necessary to conduct thorough assessments of communities prior to implementing drinking water technologies. Working with Least of These International (LOTI), a company founded by an ISAT graduate, we streamlined their current community assessment model. Our result was a survey that can be used in the field to assess a community on eight factors: Service, Institutional, Human Resource, Technology, Energy, Economic, Financial/Economic, and Social/Cultural. The tool was designed to help a surveyor or assessor rate each factor and to help standardize the method and results of each community assessment. Our tool will help LOTI decide upon a suitable sustainable drinking water technology for a community in need.



ISAT - ROOM 348

Track 5

Time: 4:45 – 5: 10 p.m.	Project #: ISAT – 51-11S
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- Presenter:** Brent Weber
Capstone Advisor: Dr. Wayne Teel
External Sponsors:
-Don Largent Roofing
-Luckstone Soil
-Martin's Native Lumber

Abstract Title: *Investigation and Implementation of Green Roofing at JMU*

Abstract:

Green roofing is a practice that offers multiple benefits as an alternative to conventional roofing. This practice serves as a viable application for James Madison University to reduce building energy costs and to continue its ongoing effort to increase environmental stewardship. This project includes an in-depth study of green roofing and its applications while focusing on its history and various designs. The central focus of the project is the construction of an extensive green roof on the ISAT third floor patio in order to apply the practice and to continue research for years to come. Through pricing and obtaining products from local companies needed for the construction of a green roof, this project offers valuable experience in sustainable practices and the green roof itself offers a learning environment for future faculty and students.



ISAT - ROOM 350

Track 6

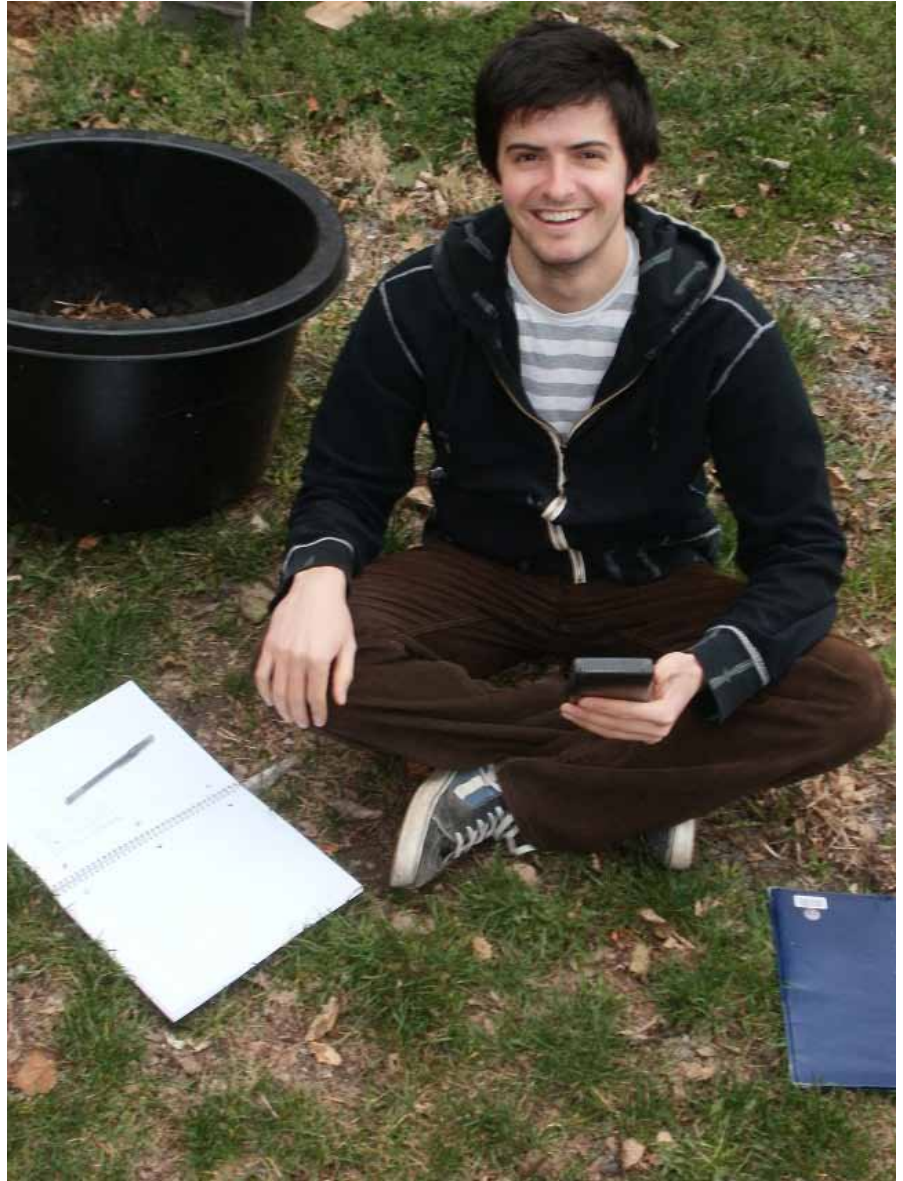
Time: 9:00 – 9:25 a.m.	Project #: ISAT – 46-11S
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Presenter: Derek Zuk
Honors Capstone: ISAT 499C
Capstone Advisor: Ms. Carolyn Oglesby, Dr. Steven Frysinger

Abstract Title: *An Examination of the Applications of Lemnoideae (Duckweed) on a Local Farm and the Conception of a Solar Powered Duckweed Collector*

Abstract:

The family Lemnoideae, colloquially known as “duckweed” or “water lentils,” are the fastest growing aquatic plants on Earth and are often viewed as a pest weed that must be eradicated. Rather than eradicate duckweed, we identify alternative applications for harvested duckweed such as feedstock, soil addition, and the production of biogas and ethanol. We explore duckweed’s potential pre-harvest to remediate industrial, municipal and agricultural wastewater. Discovering and advancing methods of working with natural processes to achieve desirable ends rather than disrupting them is a central element of sustainability, and current methods of duckweed control through the use of chemical products are irrational. Identifying a feasible and effective way to harvest duckweed from a pond would facilitate its use in practical applications. We conceive plans for an automatic duckweed harvesting system and test one of its vital design characteristics.



ISAT - ROOM 350

Track 6

Time: 9:30 – 9:55 a.m.	Project #: ISAT – 41-11S
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Presenter: Aaron Stern
Capstone Advisor: Ms. Carolyn Oglesby

Abstract Title: *Permaculture: Ecological Integrated Systems Design*

Abstract:

Permaculture, “permanent culture,” is applied design science that brings together the aspects of sustainable living and development, dynamic ecological cycles, community building, ethics, and the wholistic integration of traditional and modern cultures. It is also known as the conscious design of landscapes that mimic the patterns and relationships found in ecosystems for yielding food, fibre, and energy for local needs, in terms of systems thinking. Permaculture has been used to design buildings and landscapes, communities, energy and water systems, and less tangible constructs that collectively improve the lives of humans and their environment. The objective of this undergraduate thesis was to design Blue Feather Farm, a local organic farm, so that it encapsulated permaculture practices and principles. The goal was to develop a plan for implementation that focused on connecting the farm’s landscape and human interaction through an edible forest garden, as well as other sustainable practices. Site assessment and analysis was conducted to determine the status of the project site. Following this, the dynamic design process ensued which incorporated the customer’s requests. The final design deliverable was a detailed discussion and layout of the proposal.



ISAT - ROOM 350

Track 6

Time: 10:00 – 10:40 a.m.	Project #: ISAT – 11-11T
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Presenters: Bridget Draper, Spencer Fielding, Andrew Johnson, Caroline Mills, James J. Sabo

Capstone Advisors: Ms. Carolyn Oglesby, Dr. Steven Frysinger

Abstract Title: *Renewable Energy Production Potential of Blue Feather Farm*

Abstract:

The purpose of this project was to examine the potential for converting an unproductive 44-acre farm in the Shenandoah Valley into a renewable energy farm, which would produce renewable energy, be a model for other farmers, and help promote a nationwide movement toward sustainability. The renewable energy produced on this energy farm would offset the power demands of Blue Feather farm and excess would be



credited to the owners through net metering. To justify the benefit of creating an energy farm, this project seeks to quantify the potential for energy production based on a thorough analysis of various renewable technologies including wind, solar, and biomass. Ideally, the farm will prove viable as a net producer of energy allowing for the initial costs to be covered by the use of renewable energy. The analysis will involve comprehensive research and analysis of the technologies as well as the potential for any laws or local ordinances to impact the project. If successful, the energy farm could act as an educational center where students, professionals, and community members could come to learn about the technologies and the value of sustainability.

ISAT - ROOM 350

Track 6

Time: 10:45 – 11:10 a.m.	Project #: ISAT – 45-11S
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Presenter: Tara Giardino
Capstone Advisor: Dr. Robert McKown

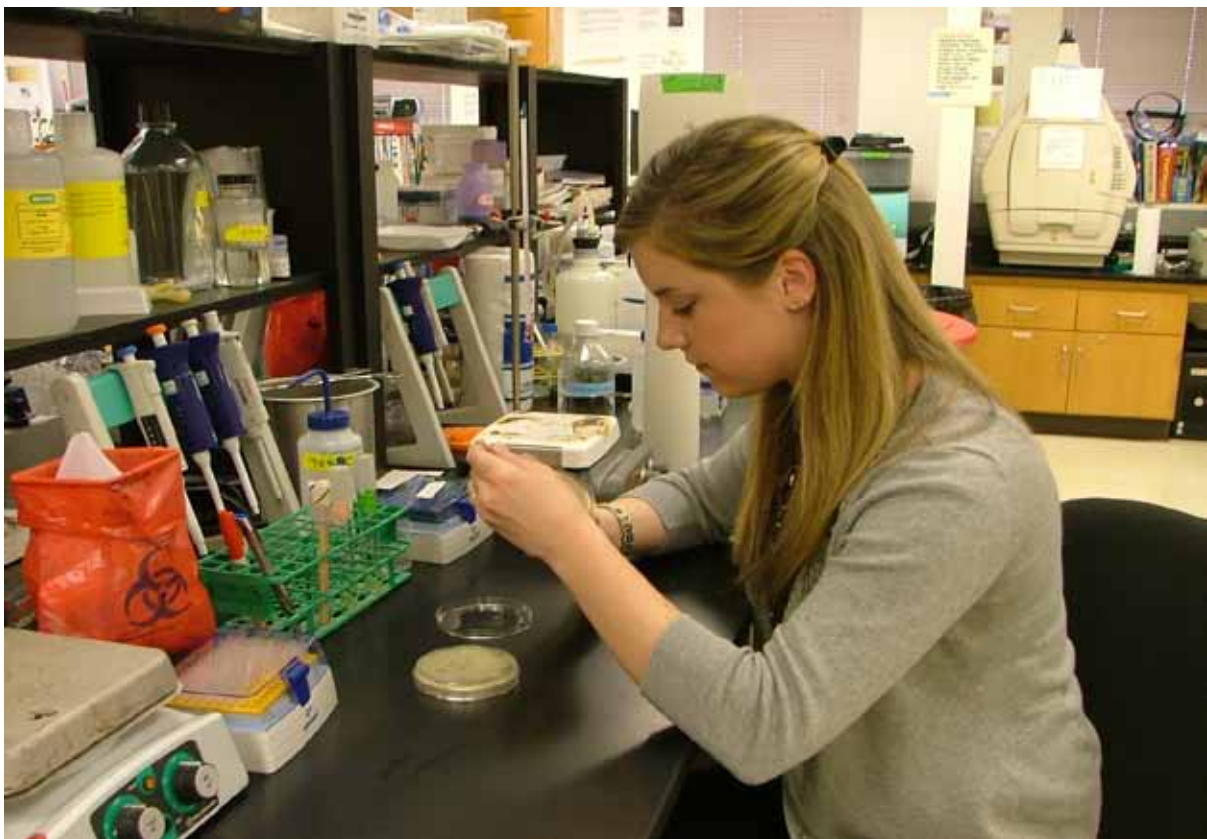
Abstract Title: *Analysis of the Human Tear Protein Lacritin for Antifungal Activity and*

Department of Integrated Science and Technology – 2011 Senior Capstone Project Symposium

Inhibition of Biofilm Formation

Abstract:

Lacritin, a natural protein component of human tears, stimulates physiologic lacrimal tear secretion, promotes cell proliferation, controls inflammation, and is antibacterial. Here we ask if lacritin is antifungal and if it can prevent biofilm formation. The antifungal activity of lacritin was tested using a Colony Forming Unit assay against the fungus *Candida albicans*, a common ocular pathogen. After analysis with the Colony Forming Unit assay, lacritin was found to have little to no antifungal activity against *C. albicans*. The ability for lacritin to inhibit *Escherichia coli* biofilms was also tested through the use of a biofilm inhibition assay. A biofilm is a complex aggregate of microorganisms that adheres to a solid surface and forms a highly resistant matrix. Full length lacritin was unable to inhibit *E. coli* biofilm growth, however, deletion variants of lacritin showed inhibitory activity.



ISAT - ROOM 350

Track 6

Time: 11:15 -11:55 a.m.	Project #: ISAT - 13-11T
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Presenters: David Laub, Jeremy Lundstrom

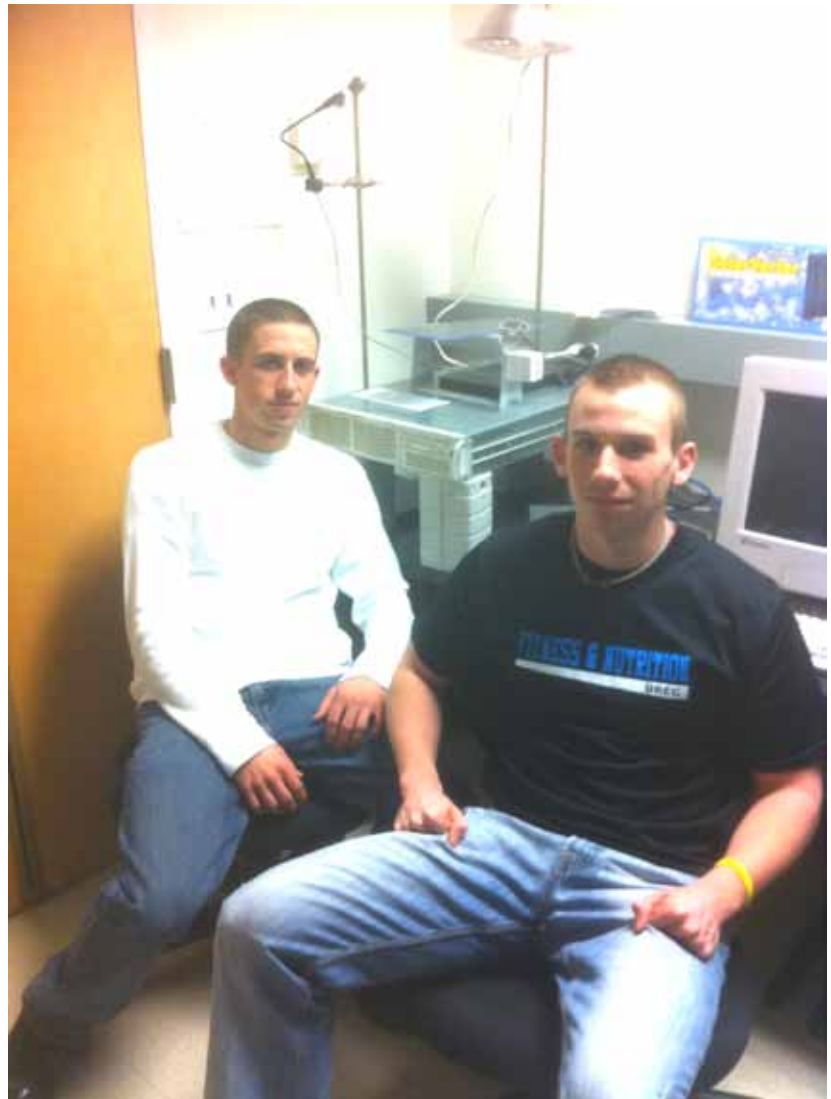
Capstone Advisor: Dr. Anthony Teate

Abstract Title: ***Development of a Prototype Laboratory Experiment that can be***

Conducted and Controlled Remotely over the Internet

Abstract:

The purpose of this project is to develop an interactive web site that will allow an end-user to control and conduct laboratory experiments that are usually performed in a classroom lab setting. Although we present this project as a specific experimental setup involving a small photovoltaic array tracking system, the Wireless Software Development Laboratory is developing a complete series of experiments that can be performed remotely. The objective is to create an environment in which students can access these laboratory experiments and perform data collection and analysis whenever and from wherever they please. This setup included a photovoltaic array attached to a motor-driven platform that will allow the angle of the array to be adjusted remotely using controls on the website. Other variables in the experiment such as the height and intensity of the lamp, etc., can also be manipulated remotely. Software code from a previously developed solar array calculator was migrated into Visual Basic and enhanced in order to make it compatible with the Microsoft .NET Framework. A SQL Server



database was developed to store and query data collected from the photovoltaic array. Microsoft Silverlight was used to drive a webcam to enable users to view the experiments in real time over the web. Users are able to access the site through secure individual accounts. Since the footprint of this setup is very small, this innovative approach also addresses the challenges of universities facing limited space allocations by creatively using current technology.

ISAT - ROOM 350

Track 6

Time: 1:00 – 1:25 p.m.

Project #: ISAT – 05-11S

Presenter: Caitlin Trotta

Capstone Advisors: Dr. Steve Cresawn, Dr. Amanda Biesecker

Abstract Title: *Investigation of Cytotoxic Genes of a Novel Bacteriophage*

Abstract:

Buruli ulcer is a debilitating disease that is seen in many third world countries. It is caused by the bacterium, *Mycobacterium ulcerans*, which produces lesions that ulcerate and release mycolactone, a dermonecrotic toxin, local immunosuppressant, and anesthetic. Because Buruli ulcer is an emerging tropical disease with little impact on the developing world, relatively little is known about it and it is classified as a neglected disease. Current treatments consist of expensive antibiotics to which many strains are now resistant and painful skin grafting in extreme cases. The purpose of this study was to develop an alternative treatment against *M. ulcerans* using a novel bacteriophage. Bacteriophages are viruses that infect bacteria. We studied two cytotoxic genes from a phage called LeBron. These genes, *lysins A* and *holin*, were isolated and cloned into a plasmid. The plasmid was then inserted into *M. smegmatis*, a fast-growing, non-pathogenic soil bacterium that is extremely similar to *M. ulcerans*. We hypothesized that, once inserted, these genes would be expressed by the bacterium and would lyse it.



ISAT - ROOM 350

Track 6

Time: 1:30 – 1:55 p.m.	Project #: ISAT – 22-11S
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Presenter: Jessica Coleman Fox

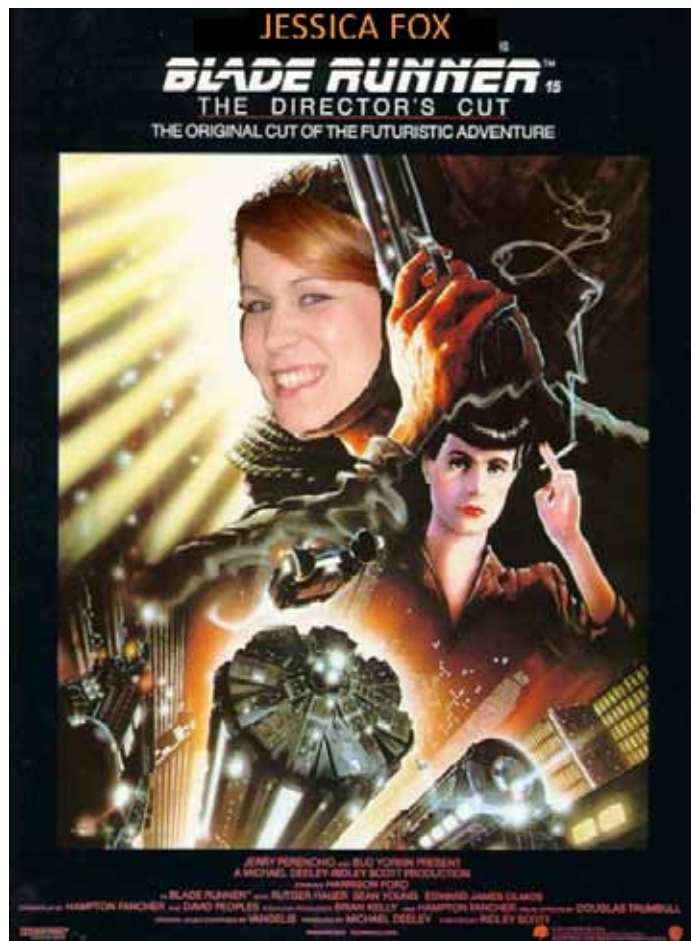
Capstone Advisors: Dr. Amanda Biesecker, Dr. Jeffrey Tang

External Sponsor: Dr. Michael Klein

Abstract Title: *The portrayal of the genetic manipulation of humans in popular science fiction films*

Abstract:

Biotechnology has often been portrayed in films, touching on the hypothetical of developing technologies, cloning, genetic enhancement, and pre-implantation genetic diagnosis. This project explores the portrayal of biotechnology, specifically those which genetically manipulate humans, in popular science fiction films. Common themes in these films include: exploitive use of technology, human genetic enhancement, betterment of society, the superiority of the biotechnologist, and the lack of awareness of the portrayed society. Movies create a dramatized world in which genetic technologies are often portrayed maliciously. This portrayal of biotechnology has led to a skewed view of current and developing biotechnologies.



ISAT - ROOM 350

Track 6

Time: 2:00 – 2:25 p.m.	Project #: ISAT – 43-11S
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Presenter: Grayson Way

Capstone Advisor: Dr. Stephanie Stockwell

Abstract Title: *Development of a Bordetella avium Live-Attenuated Vaccine*

Abstract:

Bordetella avium is an upper respiratory pathogen that causes Bordetellosis in poultry. Hemorrhagic enteritis virus (HEV) is an adenovirus that infects poultry and can result in mortality rates up to 80%. HEV also has the potential of becoming a zoonosis, meaning that it may be able to pass from avian to human hosts. The creation of a multivalent live-attenuated vaccine could confer immunity to subsequent *B. avium* and HEV infections for vaccinated turkeys; therefore, ultimately protecting humans from possible poultry-derived HEV infection. *B. avium* is an ideal platform candidate because its genome sequence is known and preliminary studies demonstrate effective transport of functional heterologous surface proteins by fusion to outer membrane protein, HagB. For our vaccine strain, *B. avium hagB* and the HEV fiber knob have been successfully fused via overlap extension PCR at genome nucleotide position 3065210. Next the fusion allele

will be cloned and recombined into the *B. avium* genome, where expression and localization of HagB::Fiber will be confirmed. Ultimately, efficacy at conferring protection in turkeys from *B. avium* and HEV infection will be tested.



GEOGRAPHIC SCIENCE PROGRAM

AGENDA - 2011 CAPSTONE PROJECT PRESENTATIONS

HHS – BUILDING – ROOM 1202

Track 7

Time: 9:00 – 9:25 a.m.	Project #: GS-06-11S
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Presenter: Kathryn Roberts
Capstone Advisor: Dr. Michael Deaton

Abstract Title: *Applications of Geographic Information Systems in Emergency Management*

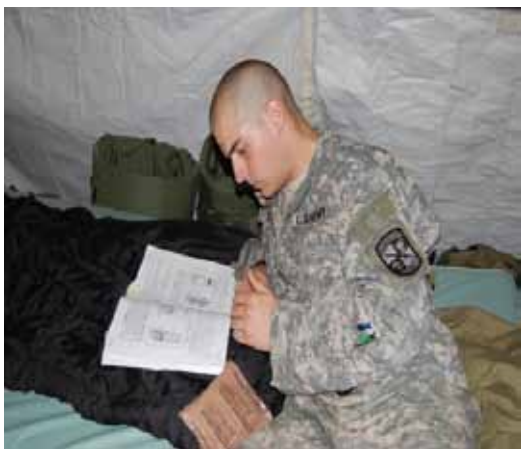
Abstract:
This project involves the application of Geographic Information Systems (GIS) within the field of Emergency Management. Emergency management involves the organization of real-time analysis and resource deployment to mitigate, prepare for, respond to and recover from the effects of hazards, natural or human. The goals of Emergency Management are; to save lives, prevent injury, protect property and the environment, enhance emergency services and map and access data more effectively. A GIS is able to assist with all of these goals and plays a critical role in creating a platform for users to be able to manage and manipulate data, as well as conduct spatial queries and display the results. More specifically this project identifies how GIS is used for landslide disaster management problems, analyzing societal, critical facilities and infrastructure vulnerabilities, as well as planning for potential shelters.

Time: 9:30 – 9:55 a.m.	Project #: GS-02-11S
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Presenter: Corey Estep
Capstone Advisor: Dr. Henry Way

Abstract Title: *Afghanistan's terrain and its effects on the War on Terror -a look at the Korengal Valley*

Abstract:
This project is a look at the terrain in Afghanistan, focused on the Korengal Valley, and how it affects the U.S. Army ability to conduct operations in the area. Afghanistan is in a unique position with its mountainous terrain, the difference in cultures throughout the country and is stuck between two major Islamic powers (Iran and Pakistan). A mix of sources from academic papers such as "Defining Place and People in Afghanistan" by Nigel J. R. Allan to interviews with several Afghanistan veterans were used in shaping the scope of how the terrain has affected the development of the Afghan culture and how it specifically affects U.S. troops in the region. From these sources I looked at the Korengal Valley to try and determine what were the major factors that lead the failure of U.S. strategy and what can be learned about Afghanistan and future Army operations.



HHS – BUILDING – ROOM 1202

Track 7

Time: 10:00 – 10:25 a.m.	Project #: GS-09-11S
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Presenter: Robin Cummings

Capstone Advisor: Dr. Henry Way

Abstract Title: *An Insight in to the Impacts of Sustainable Building Development on the Environment of Urban Settings*

Abstract:

This study attempts to analyze the effects of using sustainable building techniques in urban areas. It also aims to determine if invoking these techniques resulted in positive impacts on the environment. I reviewed literature from published books, scholarly journals, scientific case studies, government agencies, and certification organizations that involved “sustainable” buildings in various urban areas around the globe. These included certified sustainable buildings as well as buildings that utilized “green” building technologies. I compared factors such as overall energy consumption, use of “green”/recycled materials in building construction, implementation of sustainable features, general impact on the physical environment and human community, and certification status to gauge the effects sustainable buildings had on urban settings. I found that the presence of a sustainable building had a significant impact on the surrounding area, but it was a very localized effect. The majority of the buildings I researched positively influenced the neighborhoods in which they were located by cutting carbon emissions, lowering energy consumption, and reducing the amount of waste materials produced; however, there did not seem to be a noticeable difference in the environment of the urban center as a whole.



HHS – BUILDING – ROOM 1202

Track 7

Time: 11:00 – 11:25 a.m.	Project #: GS-01-11S
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Presenter: Lucy Romeo
Capstone Advisors: Dr. Jennifer Coffman, Dr. Jack Gentile
Sponsor: Dr. Jack Gentile

Abstract Title: *Anthropogenic Impacts on Costa Rica's Surrounding Marine Environment as Indicated by Hawksbill Turtles (*Eretmochelys imbricata*) and Leatherback Turtles (*Dermochelys coriacea*)*

Abstract:

Through my personal experience in Costa Rica and additional research, I have concluded that human impacts on terrestrial areas have also substantially altered the surrounding marine environment. I studied Hawksbill turtles (*Eretmochelys imbricata*) and Leatherback turtles (*Dermochelys coriacea*) as bioindicators of the health of Costa Rica's marine ecosystems. Hawksbill and leatherback turtles have experienced significant population declines in these Caribbean waters, and their declines are proportional to the increasing impacts of unsustainable plantation agriculture, rapid coastal development, and other anthropogenic factors. The marine turtle species researched have almost global ranges, spending the majority of their lives at sea, nesting and hatching on coastal beaches. Both species contribute to the biodiversity and the overall health of coral reefs in a variety of ways, including controlling prey populations that would otherwise seriously impair the reefs. My thesis describes the degradation of marine environments through the history of these species and concludes with current efforts to repopulate the region with Hawksbill and Leatherback turtles. Conservation programs in Costa Rica provide promising models for sustaining the marine turtle species, and their surrounding environments.



Time: 1:30 – 1:55 p.m.

Project #: GS-08-11S

Presenter: Daniel Melton

Capstone Advisor: Dr. Zachary Bortolot

Abstract Title: **Learning and Applying GIS Skills at a Summer Internship with the Timmons Group**

Abstract:

This past summer, I had the privilege of working with the Timmons Group as a GIS intern. At Timmons, I worked with a close-knit team of GIS specialists to take on vast and complex projects to help fulfill the contracts Timmons had accepted. By using ESRI's ArcGIS 9.3.1, I was able to work on numerous projects that greatly enhanced not only my knowledge of GIS, but also my ability to visually recognize and identify trends and problems that can occur in a map.

During my time at Timmons Group, I was able to work on a variety of projects that all seemed to provide a new method or GIS tool that I had to master in order to complete the project. I was able to get a better understanding of imagery analysis, GIS functionality, and urban planning through the projects I was given. My summer internship not only gave me valuable knowledge of how to use GIS effectively, but also on how to visualize and think about things in an urban setting. Working at Timmons Group allowed me to participate in urban planning, which is something I feel has a great impact on mankind and the environment.



HHS – BUILDING – ROOM 1202

Track 7

Time: 2:00 – 2:25 p.m.

Project #: GS-07-11S

Presenter: Eric C. Waters

Capstone Advisor: Dr. Zachary Bortolot

Abstract Title: *Using Multitemporal, High Resolution Satellite Imagery to Predict and Map Forest Variables at Reddish Knob, Virginia*

Abstract:

The purpose of this project was to use high-resolution digital aerial photographs acquired during leaf-on and leaf-off periods to determine if they can be used to accurately map forest variables such as biomass and the presence of a shrub layer. Twenty plots with a 10-meter radius were chosen at Reddish Knob, Virginia and inventoried. Two images of Reddish Knob were acquired; one leaf-on and one leaf-off. Texture values were calculated, and linear models that used the textural values to predict the forest variables were created using stepwise multiple regression. These models were then applied to the entire image to create maps showing the distributions of the measured forest variables.



Time: 2:30 – 2:55 p.m.	Project #: GS-04-11S
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Presenter: Anthony L. Montalvo

Capstone Advisor: Dr. Zachary Bortolot

Abstract Title: *Forest Inventory of Reddish Knob, Virginia*

Abstract:

Stratified random sampling is a common sampling approach used in forest inventory. This project assesses the benefits of using multitemporal aerial imagery to create the strata for stratified random sampling. The study was conducted at Reddish Knob, Virginia, which is one of the highest locations in the state. At the site, twenty 10 m radius plots were installed, and the diameters and species of the trees in these plots were recorded. These values were then used to calculate several plot level values: mean diameter, basal area per acre, biomass per acre, and carbon stored per acre. Two orthophotographs of the area were then obtained, one acquired during leaf on conditions, the other acquired during leaf off conditions. Textural values were calculated for these images and two unsupervised classifications were performed. The first classification created three classes using just the leaf on image, and the other created three classes using both images simultaneously. The means and confidence limits of the calculated variables were then estimated in three ways: Simple random sampling, stratified random sampling using the classes obtained using the single date imagery as strata, and stratified random sampling using the classes obtained using the multitemporal imagery as strata. These means and confidence limits were then compared.



Time: 3:00 – 3:25 p.m.	Project #: GS-12-11S
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Presenter: Jennifer Shunfenthal

Capstone Advisor: Dr. Carol Nash

Abstract Title: *The Effect of Transportation Corridors on Indigenous Tribes in the Amazon Rainforest*

Abstract:

Transportation corridors in the Amazon Rainforest have differentially affected indigenous cultures in Brazil’s interior. Landsat L4-5 imagery, combined with GIS data on the geographic location of transportation networks, were used to analyze the proximity of government-sanctioned roads to tribal reservations, demarcated land and tribal land use. Spatial proximity of infrastructure is used as an indicator of impact on tribal groups, their lands and resources. Four indigenous cultures, the Yanomami, Kayapo, Enawene Nawe, and Awa-Guaja, were selected for this study. The Yanomami and Kayapo tribes have sustained long-term contact with outside groups, while the Enawene Nawe and the Awa-Guaja tribes have had recent contact. All groups have been differentially affected by road development and its associated problems: diseases brought by road workers (to which the tribes have no immunity); encroaching settlers and land loss; government pressure to move to designated territories; competition for resources; and pressure to assimilate into Brazilian mainstream culture. A combination of human geography and applied geographic information science, this work is a case study of the loss of autonomy among indigenous people who are threatened with changes associated with development.



Poster Display – ISAT/CS Building – Main Hallway

THIS CAPSTONE WILL BE A POSTER PRESENTATION	Project #: GS - 14-11S
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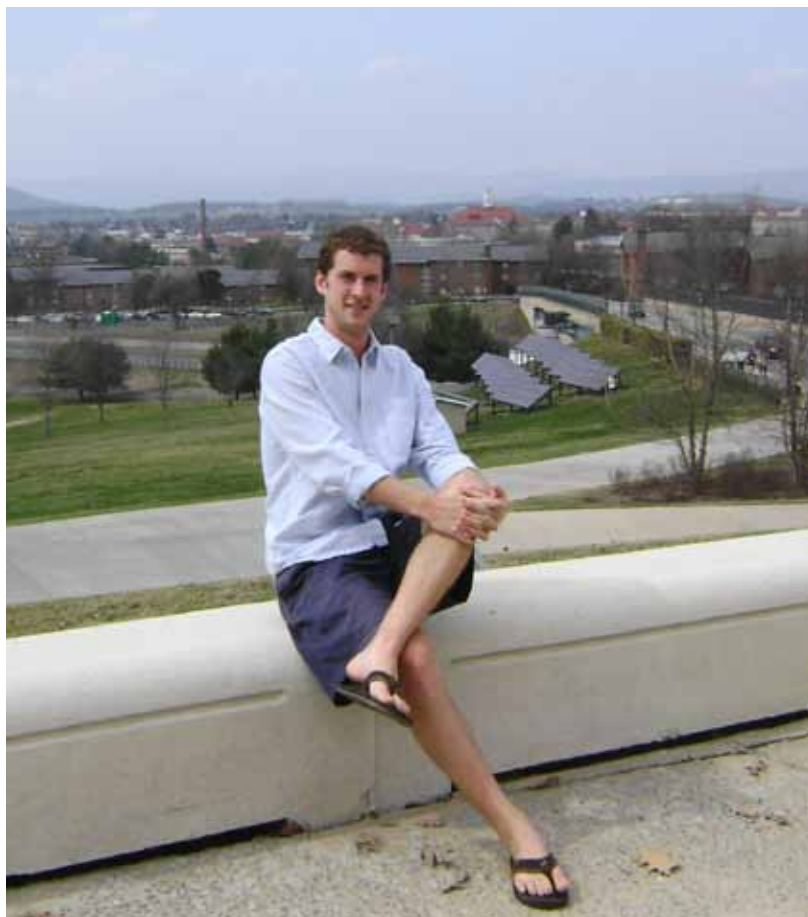
Presenter: Matt Anhold

Capstone Advisor: Dr. Amy Goodall

Abstract Title: *Internet GIS Design for the Analysis of Sub-Saharan African Crane Abundance and Distribution*

Abstract:

Africa is a large, geographical area making it difficult to accurately survey the region. In addition there is limited availability of geospatial technologies in many rural wildlife offices. This pilot study is part of an on-going research project geared toward better understanding the distribution and abundance of Sub-Saharan Africa's four crane species (*Balearica pavonina*, *Balearica regulorum*, *Grus carunculatus*, *Grus paradise*). The emphasis of the project was to investigate where crane research has taken place and where there are gaps in the distribution of research. The objectives of this study were to 1) re-evaluate an existing GIS data layer of locations where crane surveys have taken place, 2) add new data to the existing layer, 3) test the capability of the crane database for use with Internet GIS and distributive systems, and to 4) present a method that can be replicated for the study and analysis of other species' distribution. We found it challenging to accurately document and interpret spatial information in published records and other literature on cranes as limited published resources exist. In addition the Internet GISystem posed a challenge in its implementation and design to effectively interact with the African crane database.



Poster Display – ISAT/CS Building – Main Hallway

THIS CAPSTONE WILL BE A POSTER PRESENTATION	Project #: GS-13-11S
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Presenter: Kristen Cumming
Capstone Advisor: Dr. Johnathan Walker

Abstract Title: *Coral Reef Health: A Case Study on Apo Island, Philippines' Protection Methods and Coral Degradation*

Abstract:

In May of 2010 I traveled to the Philippines where I had the opportunity to research and study the coral reefs around Apo Island and the methods used to protect them. By conducting interviews, collecting data and observations, I was able to determine what protections were effective and what the people could add to their methods to make a more concrete protection plan. I also observed the top factors currently negatively affecting the reefs and how they compared to the negative factors in the past.



Poster Display – ISAT/CS Building – Main Hallway

THIS CAPSTONE WILL BE A POSTER PRESENTATION	Project #: GS-10-11S
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Presenter: Charlie Hamm
Capstone Advisor: Dr. Tom Benzing, Dr. Zachary Bortolot
External Sponsor: Trout Unlimited

Abstract Title: *Geospatial Analysis of Anglers who Requested Permits for the Upper South River Special Regulation Area in Augusta County, Virginia*

Abstract:

In January 2011, a trout fishery on the Upper South River in Augusta County, Virginia, was made available to anglers by landowners working together with Trout Unlimited and its partners. This fishery is managed under special regulations by the Virginia Department of Game and Inland Fisheries who require anglers to register and request a free permit for access to the fishery.

Using the home zip codes of permitted anglers, this project created data layers in ArcMap to display a spatial distribution of the anglers. Records from Buffalo Creek and Mossy Creek, two well-established special regulations fisheries with similar permit requirements, were also used to create similar maps for comparison. With these spatial distributions and some assumptions about travel costs, the economic impact of this new type of recreational tourism on the local economy was estimated. This study supports Trout Unlimited in their efforts to restore streams as trout habitat through increasing opportunities for angling recreation and tourism.



Poster Display – ISAT/CS Building – Main Hallway

THIS CAPSTONE WILL BE A POSTER PRESENTATION	Project #: GS-03-11S
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Presenter: Christopher Harter
Capstone Advisor: Dr. Zachary Bortolot
External Sponsor: City of Staunton

Abstract Title: *Impervious Surface Analysis*

Abstract:

This was a project I worked on during my internship for the City of Staunton. I digitized and updated an impervious surface map for the entire city. The goal was to identify and differentiate the different types of impervious surface on each parcel of property in the city through the digitization of aerial photography. After the map was completed, an analysis was performed to calculate the percentage of impervious surface on each parcel before and after the updates were made to the impervious surface map. The results were used to update the storm water taxing system for the City of Staunton.

THIS CAPSTONE WILL BE A POSTER PRESENTATION	Project #: GS-05-11S
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Presenter: Matthew W. Hodges
Capstone Advisor: Dr. Carol Nash

Abstract Title: *A Geographical Study of Three French and Indian War Frontier Forts*

Abstract:

This project combines remote sensing, archaeological survey, and the technique of GPS ground-truthing to document French and Indian War settler forts. While military fortifications of the era are well-documented, Euroamerican settlers in western Virginia often constructed their own forts -- log palisades around a fortified stone or log home. These were significant landscape elements, as many functioned as the nuclei of communities that would develop into Valley towns of the modern era. However, the log palisades, long deteriorated, were set in the ground at a shallow depth, making these forts very difficult to find. The project focuses on two fort sites in western Virginia that are



confirmed in the historical literature as having had a palisade: Stephens Fort (Frederick County) and Fort Dinwiddie (Bath County). High resolution satellite imagery is used to identify the palisade and house signatures, and the locations surveyed with GPS to confirm visible sections. All of the data are stored in a geodatabase. A major objective of this project is to serve as a model for future research and documentation of French and Indian War sites.

Poster Display – ISAT/CS Building – Main Hallway

THIS CAPSTONE WILL BE A POSTER PRESENTATION	Project #: GS-11-11S
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Presenter: Catherine Howey
Capstone Advisors: Dr. Jennifer Coffman, Dr. James Wilson
External Sponsor: Virginia Cooperative Extension

Abstract Title: *Increasing access to local foods in the Shenandoah Valley*

Abstract:

The purpose of this project is to assess current trends in local food consumption and to make local foods more accessible to consumers by developing an Internet Geographic Information System (IGIS) of local foods in the Shenandoah Valley.

The IGIS is designed for Shenandoah Valley residents and is intended to increase awareness about where to purchase local products. The map will display point features of local farmers markets, restaurants, grocery stores, universities, etc. that sell local products. It will also include information about each location such as business hours, contact information, product information and descriptions and, when applicable, a hyperlink to the business's website.

Before constructing the IGIS, research was collected to aid in the design of an informative and user-friendly IGIS. Surveys were distributed to farmers market producers and consumers as well as James Madison University students. Restaurant owners were also interviewed. Data collected from surveys and interviews was used to grasp a better



understanding of the community's relationship with local foods and to assess the need for better education and marketing to consumers about the healthy, economical, environmentally-sound decision to support local farmers and businesses.

INFORMATION ANALYSIS PROGRAM

AGENDA - 2011 CAPSTONE PROJECT PRESENTATIONS

ISAT - ROOM 136

Track 8

Time: 11:30-11:50 a.m.	Project #: IA-01-11S
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Presenter: Kathleen N. Civis
Project Advisors: Dr. Jeffrey Tang, Dr. Michael Deaton
External Sponsor: Defense Intelligence Agency (DIA)

Project Title: *Comparing Colombian and Mexican Drug Cartels*

Abstract:

This project looks at the similarities and differences of the Colombian cartels of the 1980s and 1990s and the Mexican cartels of today. The project focuses on assessing lessons learned from Colombia that could apply to Mexico. The use of causal loop diagrams will help capture the different dynamics working in the two systems and provide a means by which the similarities and differences of the two can be identified. The causal loop diagrams will provide a foundation which will help answer questions such as: what weakened the Colombian cartels? Is Mexico susceptible to the same pressure? Can Mexican cartels suffer the same fate of their Colombian predecessors? And what could undermine Mexico's efforts?

Time: 12:00 – 12:20 p.m.	Project #: IA-02-11S
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Presenter: Thomas Gardiner
Project Advisors: Dr. Jeffrey Tang, Dr. Noel Hendrickson
External Sponsor: Defense Intelligence Agency (DIA)

Project Title: *Tribal Support for Al-Qaida in the Arabian Peninsula (AQAP)*

Abstract:

This project examines the major tribes in Yemen and identifying, describing, and assessing those that support Al-Qaida in the Arabian Peninsula (AQAP), including their leaders/shaykhs. A short review of Yemen's highly contested and volatile nature will be discussed to provide a background to better understand the importance of tribes in Yemen's power landscape.

ISAT - ROOM 136

Track 8

Time: 12:25 – 12:45 p.m.	Project #: IA-03-11S
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Presenter: Gun Cho
Project Advisor: Dr. Jeffrey Tang

Project Title: *South Korea: Emerging Security Perspectives and the US Alliance*

Abstract:

The South Korea-US alliance is changing in response to Seoul's growing global standing and the evolving security environment in Asia. Seoul is rethinking its assumptions about alliance goals, command relations, and force posture. Taking these factors into account, this project looks at the future of US-South Korean alliance and studies the major factors that will affect South Korean policy in the next decade.

Time: 12:50 – 1:10 p.m.	Project #: IA-04-11T
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Presenters: Katie Shaw, Heather L. Sutherland
Project Advisors: Dr. Jeffrey Tang, Dr. Frances Flannery, Dr. Robert Kolvoord

Project Title: *Al Shabaab in Somalia and Their Future Global Jihad*

Abstract:

Al Shabaab, whose name means "the youth," began operating in Somalia in 2007. Their initial motivations were to drive Ethiopian troops out of Somalia and to establish an Islamic state. Since their inception, the group's rhetoric and behavior have shifted, reflecting an enthusiasm to strike internationally. In 2008, Al Shabaab began issuing threats against the United States and now professes an ideology resembling al Qaeda's. The group has pledged allegiance to Osama bin Laden and views itself as part of the global jihad network. Al Shabaab uses techniques characteristic of a terrorist group when targeting its enemies, including various bombing techniques and assassinations.

Al Shabaab currently controls much of southern and central Somalia, including large portions of the capital, Mogadishu. Al Shabaab maintains power by using violence and intimidation enforcing a strict interpretation of Shari'a law.

Al Shabaab is composed of both Somali and international militants, including dozens from the United States and Europe. The danger posed by Al Shabaab to the United States and international security is imminent. An effort to recruit persons outside Somalia, especially United States citizens, expresses a global effort to fight and elevates the threat to the domestic United States.

ISAT - ROOM 136

Track 8

Time: 1:15 – 1:50 p.m.	Project #: IA-05-11T
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Presenters: James Buchanan, Michael Van Sickler, Brad Siragusa

Project Advisor: Dr. Jeffrey Tang

External Sponsor: National Drug Intelligence Center (NDIC, USDOJ)

Project Title: *Mankind's Oldest Language and Its Second Oldest Profession*

Abstract:

This project will demonstrate the usefulness of body language analysis in an intelligence context, and will show that a systematic methodology can aid analysts in assessing human deception at an accuracy higher than chance.

Time: 1:55 – 2:15 p.m.	Project #: IA-06-11S
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Presenter: Patrick Folliard

Project Advisor: Dr. Jeffrey Tang

Project Title: *Flashpoints in the Caucasus: Understanding the Strategic Elements of the Region*

Abstract:

The distribution of strategic resources in the Caucasus, particularly hydroelectric power plants and oil pipelines, are situated in such a manner that they may be easily manipulated to gain a destabilizing advantage by a number of different groups. This threat will continue to exist unless specific measures are taken to normalize diplomatic relations in the region. The proximity of the Caucasus to Iran, Russia, and Turkey makes it of vital significance not only to these nations, but also to a wide variety of foreign investors and national governments. The increasing radicalization of the region's Muslim population by foreign

Mujahideen adds another layer of complexity to the situation. This report will attempt to address the likely outcomes of several possible future scenarios that may occur in the Caucasus in the next five years.

ISAT - ROOM 136

Track 8

Time: 2:20 – 2:40 p.m.	Project #: IA-07-11S
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Presenter: Erich C. W. McGuffey
Project Advisor: Dr. Jeffrey Tang
External Sponsor: COL (Ret) David Lemelin

Project Title: *Risk to National Security: Challenges and Solutions to Army Recruiting in the Modern World*

Abstract:

The current US recruiting strategy will not be sufficient to meet recruiting requirements. Diminishing recruiting pools suggest a change in strategy to ensure the Army has the strength to deal with threats to national security.

Time: 2:45 – 3:05 p.m.	Project #: IA-08-11S
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Presenter: Kevin Rundle
Project Advisor: Dr. Jeffrey Tang

Project Title: *Current and Future Trends of Prescription Drug Abuse in the United States*

Abstract:

In the past decade, the United States has seen a sharp rise in the abuse or non-medical use of prescription medication. As new pharmaceuticals flood the country, especially opiates such as Oxycodone and Hydrocodone, the potential for abuse, as well as the market for their sale has expanded. Doctors divert pharmaceuticals for monetary gain, often to 'doctor shoppers' who are seeking medication to obtain a 'high'. Many Americans see no problem in giving their prescription medications to family members or friends who are experiencing pain, and don't even realize that such action is illegal. Patients

often start using them for a legitimate reason such as intense pain or injury. The nature of these drugs, especially the opiates, makes them addictive, and soon the user is no longer in need, but simply desires the 'high.' Within the next decade there may be a substantial increase in the nonmedical use of prescription drugs within the United States. Addiction rates may rise as doctor diversion continues and the lack of knowledge about pharmaceuticals fails to convince the public that prescription drug abuse is dangerous. Prescription drug abuse needs to be understood, and should be a focus for both government and local communities.

ISAT - ROOM 136

Track 8

Time: 3:10 – 3:30 p.m.	Project #: IA-09-11S
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Presenter: Joshua Jenkins
Project Advisor: Dr. Jeffrey Tang
External Sponsor: Defense Intelligence Agency (DIA)

Project Title: *Higher Education in Iran: A Portrait of Iranian Universities*

Abstract:

This project aims to present a comprehensive view of Iranian Universities and their effect on regime stability. The study investigates key universities, their student bodies, and the methods by which the government attempts to control the spectrum of thought through them. Universities in Iran have long been a cause for concern among the regime's leadership. To try and suppress this potential for unrest, the Iranian government exercises direct influence over the curricula and faculty in schools. Despite these efforts, universities continue to act as fora for political debate, which has led to unrest. As Iran continues to play an important role in the stability of the region, the need to understand the inner workings of the regime and the mechanisms used to control the population becomes increasingly critical. By using the country's universities as indicators for potential unrest, we can hope to form better policy decisions with better foresight than before.

Time: 3:35 – 3:55 p.m.	Project #: IA-10-11S
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Presenter: Chase Jarvis
Project Advisor: Dr. Jeffrey Tang
External Sponsor: Sgt. Mike Layman

Project Title: *Development of Custom Reporting Solution for Rockingham County Sheriff's Office Criminal Records database*

Abstract:

Databases play a critical role in organizing information on people, places, and events for the Intelligence Community. Many federal resources, such as the Federal Bureau of Investigation's National Crime Information Center, are a collation of information contained within databases from all of state and local agencies. The Rockingham County Sheriff's Office criminal records database is a contributor to these federal databases, thus presenting an opportunity to develop an application for a customer working with a dataset of scale and nature relevant to the Intelligence Community. The purpose of this project is to research and develop a custom reporting solution for the Rockingham County Sheriff's Office's criminal records database that provides reports based on real-time data using industry accepted technical solutions and current network infrastructure. The solution will serve as an upgrade to the currently used Microsoft Access based reporting tool, and utilize Microsoft SQL, SQL Server Reporting Services, and Microsoft .NET Framework technologies.

ISAT - ROOM 136

Track 8

Time: 4:00 – 4:20 p.m.	Project #: IA-12-11S
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Presenter: Craig Brown
Project Advisor: Dr. Jeffrey Tang

Project Title: *Rethinking the Complex Dynamics of Somali Statelessness, Terrorism, and Foreign Intervention: A Guide for Analysts and Policymakers*

Abstract:

Despite organized efforts by the United States and the United Nations to establish an effective and secure democracy in Somalia, the nation continues to lack a functioning central government and has been classified as a region of lawlessness, anarchy, and instability. This research project will investigate the future implications of Somalia's state collapse through the formulation and assessment of multiple strategies and their potential consequences. However, before proceeding to this investigation, the paper will address the major social, institutional, and cognitive challenges that are currently obstructing a wholly objective analysis of Somalia and its effective communication to analysts, policymakers, academics, and the media. This report will place the commonly-held assumption that "anarchy" is necessarily undesirable under serious scrutiny through a comparative analysis of realistic institutional alternatives. It will then address the major rational constructivist limits to foreign intervention as applied to Somalia. The initial focus of my analysis will be on assessing the current environment and the factors driving the complex social dynamics in Somalia. The culmination of this research will be the application of an analytical method known as "counterfactual reasoning" to generate and assess the probable consequences of multiple potential strategies.

Time: 4:25 – 4:50 p.m.	Project #: IA-13-11T
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Presenters: Erica White, Tyler Hickey
Project Advisor: Dr. Jeffrey Tang

Project Title: *Trouble at Home: Right-Wing Militia Groups in the United States*

Abstract:

We will be assessing the potential threat that Right Wing Militia groups will pose over the next 5-10 years. There has been a great deal of focus on Middle East extremists over the last few years while homegrown groups have been largely overlooked. Our project will analyze the level of threat these groups pose, and offer possible policy recommendations to assist law enforcement and other government officials in handling this threat.

DEPARTMENT OF INTEGRATED SCIENCE AND TECHNOLOGY – PRESENTATIONS LISTING BY TIME

TIME	LOCATION	LAST NAME	FIRST NAME	CAPSTONE TITLE
9:00-10:00 a.m.	ISAT-Rm 159	Loso	Drew	Electric Truck Conversion for JMU Facilities Management
9:00-10:00 a.m.	ISAT-Rm 159	Stevens	Justin	Electric Truck Conversion for JMU Facilities Management
9:00-9:25 a.m.	ISAT-Rm 348	Lynch	Adam	A Plan for the Restoration and Revitalization of East Campus Creek
9:00-9:25 a.m.	ISAT-Rm 148	Wagner	Andrew	Feasibility and Social Analysis of the Implementation of a Mobile Thermal Destruction Unit in Rockingham County, Virginia
9:00-9:25 a.m.	ISAT-Rm 350	Zuk	Derek	An Examination of the Applications of Lemnoideae (Duckweed) on a Local Farm and the Conception of a Solar Powered Duckweed Collector
9:00-9:40 a.m.	ISAT-Rm 337	Klepper	Alyssa	The Use of Electroencephalogram Technology to Harness Brain Waves that Signal Motion to Control an External Computer Application
9:00-9:40 a.m.	ISAT-Rm 337	Mason	Morgan	The Use of Electroencephalogram Technology to Harness Brain Waves that Signal Motion to Control an External Computer Application
9:00-9:50 a.m.	ISAT-Rm 150	Clark	Stephen	Developing a Photovoltaic Powered Irrigation System
9:00-9:50 a.m.	ISAT-Rm 150	Kelaher	Joshua	Developing a Photovoltaic Powered Irrigation System
9:00-9:50 a.m.	ISAT-Rm 150	Murgia	Matthew	Developing a Photovoltaic Powered Irrigation System
9:30-10:10 a.m.	ISAT-Rm 348	Drummond	Kurtis	Impacts of Waynesboro Wastewater Treatment Plant Renovations on Nutrient Levels, Periphyton, and Mercury Update in the South River
9:30-10:10 a.m.	ISAT-Rm 348	Foltz	Brandon	Impacts of Waynesboro Wastewater Treatment Plant Renovations on Nutrient Levels, Periphyton, and Mercury Update in the South River
9:30-9:55 a.m.	ISAT-Rm 148	Ramirez	Ryan	Researching and Implementing a Policy to Promote Sustainable Energy in Virginia
9:30-9:55 a.m.	ISAT-Rm 350	Stern	Aaron	Permaculture: Ecological Integrated Systems Design
9:45-10:25 a.m.	ISAT-Rm 337	Dudley	Jeremy	Networked Home Power Consumption Monitoring and Auditing System
9:45-10:25 a.m.	ISAT-Rm 337	Ratliff	Ian	Networked Home Power Consumption Monitoring and Auditing System

9:45-10:25 a.m.	ISAT-Rm 337	Ritchey	Sean	Networked Home Power Consumption Monitoring and Auditing System
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DEPARTMENT OF INTEGRATED SCIENCE AND TECHNOLOGY – PRESENTATIONS LISTING BY TIME

TIME	LOCATION	LAST NAME	FIRST NAME	CAPSTONE TITLE
9:55-10:40 a.m.	ISAT-Rm 150	Rakaric	Robert	Solar Assisted Light Electric Vehicle (SALEV)
9:55-10:40 a.m.	ISAT-Rm 150	Thompson	Joshua	Solar Assisted Light Electric Vehicle (SALEV)
9:55-10:40 a.m.	ISAT-Rm 150	Young	Brian	Solar Assisted Light Electric Vehicle (SALEV)
10:00-10:25 a.m.	ISAT-Rm 148	Moschopoulos	Constantine	Government Regulations and Social Context of Organic Food
10:00-10:25 a.m.	ISAT-Rm 148	Randolph	Owen	Government Regulations and Social Context of Organic Food
10:00-10:40 a.m.	ISAT-Rm 350	Draper	Bridget	Renewable Energy Production Potential of Blue Feather Farm
10:00-10:40 a.m.	ISAT-Rm 350	Fielding	Spencer	Renewable Energy Production Potential of Blue Feather Farm
10:00-10:40 a.m.	ISAT-Rm 350	Johnson	Andrew	Renewable Energy Production Potential of Blue Feather Farm
10:00-10:40 a.m.	ISAT-Rm 350	Mills	Caroline	Renewable Energy Production Potential of Blue Feather Farm
10:00-10:40 a.m.	ISAT-Rm 350	Sabo	James	Renewable Energy Production Potential of Blue Feather Farm
10:15-10:55 a.m.	ISAT-Rm 348	Reiske	Justin	Ecological Effects of Flood Control Dams in Virginia's Ridge and Valley Ecoregion
10:15-10:55 a.m.	ISAT-Rm 348	Robinson	Emily	Ecological Effects of Flood Control Dams in Virginia's Ridge and Valley Ecoregion
10:30-10:55 a.m.	ISAT-Rm 337	Ferraro	Andrew	WiMAX Proposal
10:45-11:10 a.m.	ISAT-Rm 350	Giardino	Tara	Analysis of the Human Tear Protein Lacritin for Antifungal Activity and Inhibition of Biofilm Formation
10:45-11:25 a.m.	ISAT-Rm 150	Hammond	James	System Performance Analysis of a Domestic Solar Hot Water System in Rockingham County, Virginia

10:45-11:25 a.m.	ISAT-Rm 150	Reznick	Max	System Performance Analysis of a Domestic Solar Hot Water System in Rockingham County, Virginia
11:00-11:40 a.m.	ISAT-Rm 337	Cardona	Kenneth	Cellular on Wifi: Dead Zone Solution
11:00-11:40 a.m.	ISAT-Rm 337	Collins	Joshua	Cellular on Wifi: Dead Zone Solution
11:00-11:40 a.m.	ISAT-Rm 337	Kim	Sol	Cellular on Wifi: Dead Zone Solution

DEPARTMENT OF INTEGRATED SCIENCE AND TECHNOLOGY – PRESENTATIONS LISTING BY TIME

TIME	LOCATION	LAST NAME	FIRST NAME	CAPSTONE TITLE
11:00-11:40 a.m.	ISAT-Rm 348	Cooke	Libby	Development of a Multivalent Heterologous Bordetella avium and Hemorrhagic Enteritis Virus Live-Attenuated Vaccine for use in Poultry
11:00-11:40 a.m.	ISAT-Rm 348	Ashworth	James	Development of a Multivalent Heterologous Bordetella avium and Hemorrhagic Enteritis Virus Live-Attenuated Vaccine for use in Poultry
11:15-11:55 a.m.	ISAT-Rm 350	Laub	David	Development of a Prototype Laboratory Experiment that can be Conducted and Controlled Remotely over the Internet
11:15-11:55 a.m.	ISAT-Rm 350	Lundstrom	Jeremy	Development of a Prototype Laboratory Experiment that can be Conducted and Controlled Remotely over the Internet
11:30-11:55 a.m.	ISAT-Rm 148	Kuhnley	Amanda	A New Approach to Materials Education
11:30-12:10 p.m.	ISAT-Rm 150	Heintz	Matthew	Full Cycle Analysis of Fuel Operated Heater Pilot Study
11:30-12:10 p.m.	ISAT-Rm 150	Walker	Jamison	Full Cycle Analysis of Fuel Operated Heater Pilot Study
1:00-1:25 p.m.	ISAT-Rm 337	Jin	Douglas	An Expert System for Creating Quality Management Systems
1:00-1:25 p.m.	ISAT-Rm 150	Murphy	Matthew	Small Wind Training and Testing Facility on JMU Campus
1:00-1:25 p.m.	ISAT-Rm 148	Price	Gregory	Analyzing Dynamic Biogas Recovery Systems for Agricultural Use
1:00-1:25 p.m.	ISAT-Rm 350	Trotta	Caitlin	Investigation of Cytotoxic Genes of a Novel Bacteriophage

1:00-1:40 p.m.	ISAT-Rm 348	Deitch	Christina	Biochar Production and Heat Capture: Refining The Design of a Small Scale Production System
1:00-1:40 p.m.	ISAT-Rm 348	Gazenski	Kimberly	Biochar Production and Heat Capture: Refining The Design of a Small Scale Production System
1:00-2:00 p.m.	ISAT-Rm 159	Attard	Daniel	Hydrogen Demonstration for Public Education and Outreach
1:00-2:00 p.m.	ISAT-Rm 159	Gore	Ellis	Hydrogen Demonstration for Public Education and Outreach
1:00-2:00 p.m.	ISAT-Rm 159	Knox	Daniel	Hydrogen Demonstration for Public Education and Outreach
1:00-2:00 p.m.	ISAT-Rm 159	Moellers	Taylor	Hydrogen Demonstration for Public Education and Outreach
1:00-2:00 p.m.	ISAT-Rm 159	Spurr	Andrew	Hydrogen Demonstration for Public Education and Outreach
1:30-1:55 p.m.	ISAT-Rm 350	Fox	Jessica	The portrayal of the genetic manipulation of humans in popular science fiction films

Department of Integrated Science and Technology – 2011 Senior Capstone Project Symposium

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DEPARTMENT OF INTEGRATED SCIENCE AND TECHNOLOGY – PRESENTATIONS LISTING BY TIME

TIME	LOCATION	LAST NAME	FIRST NAME	CAPSTONE TITLE
1:30-1:55 p.m.	ISAT-Rm 150	Gaertner	Evan	Wind modeling and forecasting through advanced data collection techniques in complex terrain in western Rockingham County
1:30-1:55 p.m.	ISAT-Rm 337	Merkel	Matthew	Development of a Residential Site Assessment and Economic Feasibility Calculator for Solar Thermal Systems in Virginia
1:30-1:55 p.m.	ISAT-Rm 148	Katich	Robert	Application of Process Analysis within Sales & Services
1:45-2:25 p.m.	ISAT-Rm 348	Branner, IV	Brad	Biochar Field Trials in a Symbiotoc Polyculture
1:45-2:25 p.m.	ISAT-Rm 348	Greene	Marshall	Biochar Field Trials in a Symbiotoc Polyculture
2:00-2:25 p.m.	ISAT-Rm 148	Carwell	Jason	A Computer-Automated Inspection Application in Medical Supply Manufacturing
2:00-2:25 p.m.	ISAT-Rm 337	Madden	Graham	Mobile Assessment Tool for Water, Sanitation and Household Energy Technology Selection in Developing Countries
2:00-2:25 p.m.	ISAT-Rm 350	Way	Grayson	Development of a Bordetella avium Live-Attenuated Vaccine
2:00-2:40 p.m.	ISAT-Rm 150	Bucci, Jr.	John	Wind for Schools – Thomas Harrison Middle School, Harrisonburg, VA
2:00-2:40 p.m.	ISAT-Rm 150	Jennings	Rob	Wind for Schools – Thomas Harrison Middle School, Harrisonburg, VA

2:15-3:15 p.m.	ISAT-Rm 159	Allen	Brady	American Motorcycle, American Fuel
2:15-3:15 p.m.	ISAT-Rm 159	Balac	Taylor	American Motorcycle, American Fuel
2:15-3:15 p.m.	ISAT-Rm 159	Clerico	Kyle	American Motorcycle, American Fuel
2:15-3:15 p.m.	ISAT-Rm 159	Copley	William	American Motorcycle, American Fuel
2:15-3:15 p.m.	ISAT-Rm 159	Green	Brandyn	American Motorcycle, American Fuel
2:15-3:15 p.m.	ISAT-Rm 159	Romaniw	Robert	American Motorcycle, American Fuel
2:30-2:55 p.m.	ISAT-Rm 348	Becker	Jillian	The Characterization of Locally Produced Biochars for use as an Agricultural Amendment
2:30-3:10 p.m.	ISAT-Rm 148	Arrington	William	A More Unified Airline Industry Using Radio Frequency Identification
2:30-3:10 p.m.	ISAT-Rm 148	Sterner	Mark	A More Unified Airline Industry Using Radio Frequency Identification
2:30-3:10 p.m.	ISAT-Rm 337	Jones	Courtney	Harrisonburg – Department of Public Transportation Itinerary Planner
2:30-3:10 p.m.	ISAT-Rm 337	Long	Amber	Harrisonburg – Department of Public Transportation Itinerary Planner

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DEPARTMENT OF INTEGRATED SCIENCE AND TECHNOLOGY – PRESENTATIONS LISTING BY TIME

TIME	LOCATION	LAST NAME	FIRST NAME	CAPSTONE TITLE
2:45-3:25 p.m.	ISAT-Rm 150	Johnson	Jean	Wind for Schools – Woodstock, VA
2:45-3:25 p.m.	ISAT-Rm 150	Miller	Gregory	Wind for Schools – Woodstock, VA
2:45-3:25 p.m.	ISAT-Rm 150	Pearson	Cara	Wind for Schools – Woodstock, VA
3:00-3:25 p.m.	ISAT-Rm 348	Martin	Benjamin	The Use of Ozone to Oxidize Iron, Aluminum, and Manganese at Realistic Concentrations Found in Acid Mine Drainage
3:15-3:40 p.m.	ISAT-Rm 148	Oliver	Nathan	Entrepreneurship in Energy: Laying the Groundwork for the Establishment of a Residential Energy Audit Business

3:15-3:40 p.m.	ISAT-Rm 337	Nguyen	An	Asset Tracking Through the use of Radio Frequency Identification
3:30-4:10 p.m.	ISAT-Rm 150	Hughes	Trey	Assisting the Development Phase of a Community Scale Wind Turbine in Tangier Island, VA
3:30-4:10 p.m.	ISAT-Rm 150	Johnson	William	Assisting the Development Phase of a Community Scale Wind Turbine in Tangier Island, VA
3:30-4:10 p.m.	ISAT-Rm 150	Rupnik	Bryson	Assisting the Development Phase of a Community Scale Wind Turbine in Tangier Island, VA
3:30-3:55 p.m.	ISAT-Rm 348	Grabau	Andrew	Improved Reactor Design for Heavy Metal Removal Using Ozone
3:45-4:25 p.m.	ISAT-Rm 148	Hulvey	Isaac	Crop Wastes to Bright Lights: Applications of Producer Gas Technology in Developing Countries
3:45-4:25 p.m.	ISAT-Rm 148	Pugh	Thomas	Crop Wastes to Bright Lights: Applications of Producer Gas Technology in Developing Countries
4:00-4:40 p.m.	ISAT-Rm 348	Etz	Kristen	Streamlining a Community Assessment for a Sustainable Drinking Water Technology
4:00-4:40 p.m.	ISAT-Rm 348	Jones	Michael	Streamlining a Community Assessment for a Sustainable Drinking Water Technology
4:45-5:10 p.m.	ISAT-Rm 348	Weber	Brent	Investigation and Implementation of Green Roofing at JMU

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GEOGRAPHIC SCIENCE PROGRAM - PRESENTATIONS LISTING BY TIME

TIME	LOCATION	LAST NAME	FIRST NAME	CAPSTONE TITLE
9:00-9:25 a.m.	HHS - Rm 1202	Roberts	Kathryn	Application of geographic Information System in Emergency Management
9:30-9:55 a.m.	HHS - Rm 1202	Estep	Cory	Afghanistan's terrain and its effects on the War on Terror: a look at the Korengal Valley
10:00-10:25 a.m.	HHS - Rm 1202	Cummings	Robin	An Insight into the Impacts of Sustainable Building Development on the Environment of Urban Settings

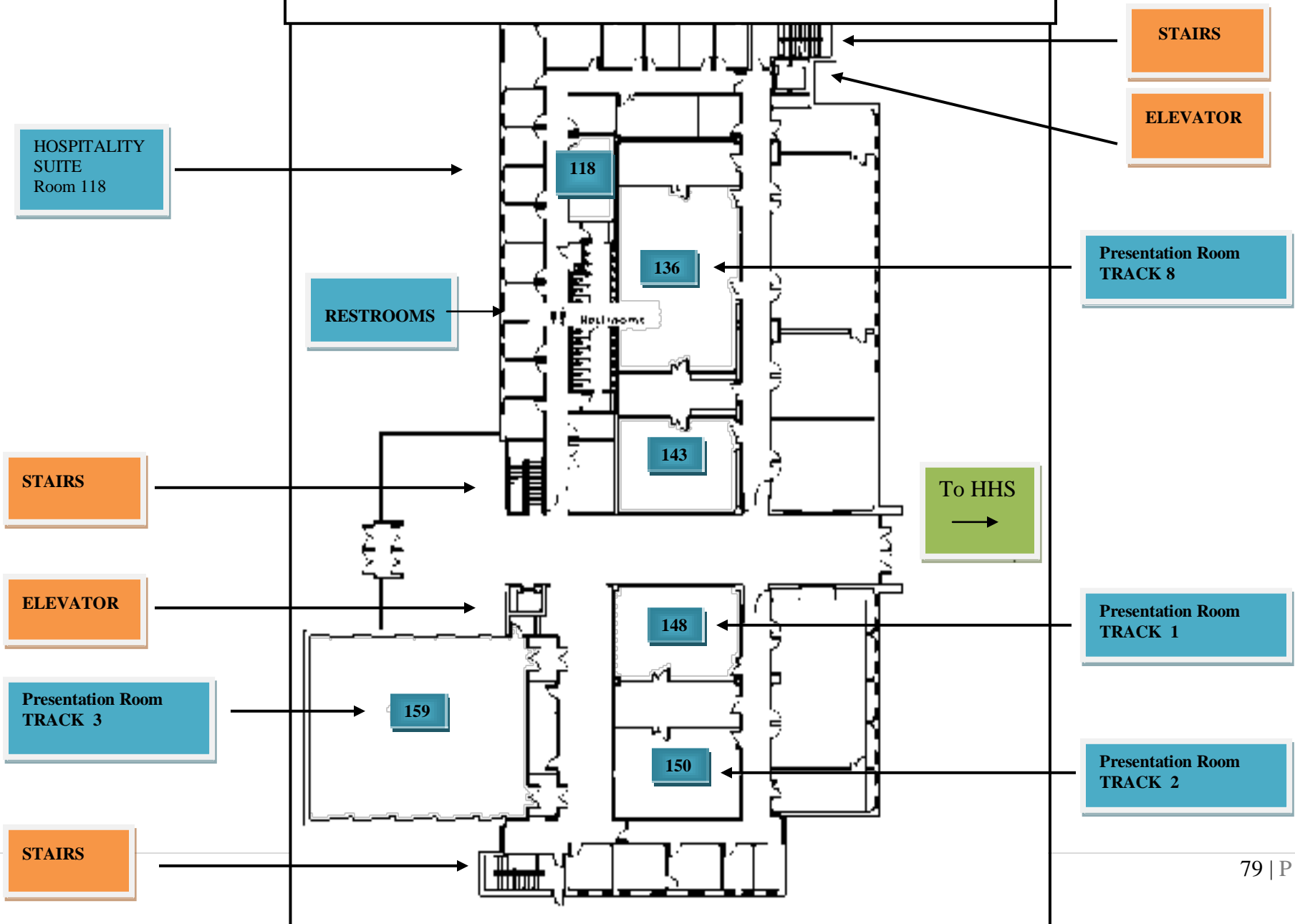
11:00-11:25 a.m.	HHS - Rm 1202	Romeo	Lucy	Anthropogenic Impacts on Costa Rica's surroundings Marine Environment as indicated by Hawksbill Turtles (<i>Eretmochelys imbricata</i>) and Leatherback Turtles (<i>Dermochelys coriacea</i>)
1:30-1:55 p.m.	HHS - Rm 1202	Melton	Daniel	Learning and applying GIS skills at a Summer Internship with the Timmons Group
2:00-2:25 p.m.	HHS - Rm 1202	Waters	Eric	Using Multitemporal, High Resolution Satellite Imagery to Predict and Map Forest Variables at Reddish Knob, Virginia
2:30-2:55 p.m.	HHS - Rm 1202	Montalvo	Anthony	Forestry Inventory of Reddish Knob, Virginia
3:00-3:25 p.m.	HHS - Rm 1202	Shunfenthal	Jennifer	The Effect of Transportation Corridors on Indigenous Tribes in the Amazon Rainforest
Poster Session	ISAT Main Hallway	Anhold	Matt	Internet GIS Design for the Analysis of Sub-Saharan African Crane Abundance and Distribution
Poster Session	ISAT Main Hallway	Cumming	Kristen	Coral Reef Health: A Case Study on Apo Island, Philippines' protection methods and Coral Degradation
Poster Session	ISAT Main Hallway	Hamm	Charles	Geospatial Analysis of Anglers who Requested Permits for the Upper South River Special Regulation Area in Augusta County, Virginia
Poster Session	ISAT Main Hallway	Harter	Christopher	Impervious Surface Analysis
Poster Session	ISAT Main Hallway	Hodges	Matthew	A Geographical Study of Three French and Indian War Frontier Forts
Poster Session	ISAT Main Hallway	Howey	Catherine	Increasing access to local foods in the Shenandoah Valley

INFORMATION ANALYSIS PROGRAM - PRESENTATIONS LISTING BY TIME

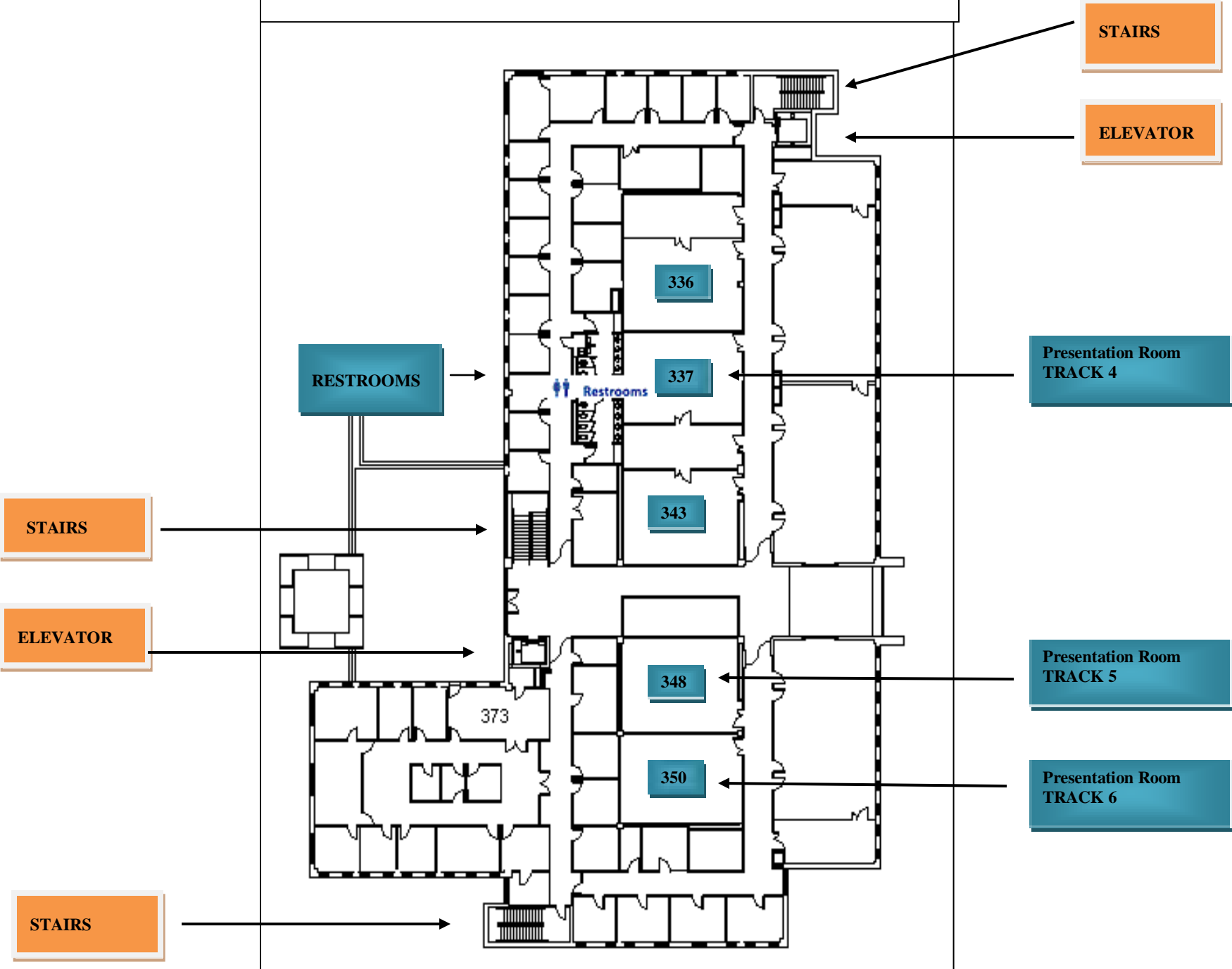
TIME	LOCATION	LAST NAME	FIRST NAME	CAPSTONE TITLE
10:30-10:55 a.m.	ISAT - Room 148	Murphy	Erin	Water Privatization in Nigeria

11:00-11:25 a.m.	ISAT - Room 148	Mitchell Hall	Blake Cory	Analyzing Cocaine Trafficking and the Impact of Law Enforcement Operations within the Western Hemisphere
11:30-11:50 a.m.	ISAT - Room 136	Civis	Kathleen	Comparing Colombian and Mexican Drug Cartels
12:00-12:20 p.m.	ISAT - Room 136	Gardiner	Thomas	Tribal Support for Al-Qaida in the Arabian Peninsula (AQAP)
12:25-12:45 p.m.	ISAT - Room 136	Cho	Gun	South Korea: Emerging Security Perspectives and the US Alliance
12:50-1:10 p.m.	ISAT - Room 136	Shaw Sutherland	Katie Heather	Al Shabaab in Somalia and Their Future Global Jihad
1:15-1:50 p.m.	ISAT - Room 136	Buchanan Siragusa Van Sickler	James Brad Michael	Mankind's Oldest Language and Its Second Oldest Profession
1:55-2:15 p.m.	ISAT - Room 136	Folliard	Patrick	Flashpoints in the Caucasus: Understanding the Strategic Elements of the Region
2:20-2:40 p.m.	ISAT - Room 136	McGuffey	Erich	Risk to National Security: Challenges and Solutions to Army Recruiting in the Modern World
2:45-3:05 p.m.	ISAT - Room 136	Rundle	Kevin	Current and Future Trends of Prescription Drug Abuse in the United States
3:10-3:30 p.m.	ISAT - Room 136	Jenkins	Joshua	Higher Education in Iran: A Portrait of Iranian Universities
3:35-3:55 p.m.	ISAT - Room 136	Jarvis	Chase	Development of Custom Reporting Solution for Rockingham County Sheriff's Office Criminal Records Database
4:00-4:20 p.m.	ISAT - Room 136	Brown	Craig	Rethinking the Complex Dynamics of Somali Statelessness, Terrorism, and Foreign Intervention: A Guide for Analysis and Policymakers
4:25-4:50 p.m.	ISAT - Room 136	Hickey White	Tyler Erica	Trouble at Home: Right-Wing Militia Groups in the United States

ISAT/CS Building - First Floor Presentation Rooms



ISAT/CS Building – 3rd Floor Presentation Rooms



HHS Building – GEOGRAPHIC SCIENCE CAPSTONE PRESENTATIONS

Presentations – HHS – Room 1202

