TABLE OF CONTENTS

Table of Contents .................................................................................................................. 2-4
Description of Fellowship and Scholarship Program ............................................................ 5
Membership .......................................................................................................................... 6
Ohio Congressional Map ................................................................................................. 7

**Fellows**

<table>
<thead>
<tr>
<th>Name</th>
<th>University</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bradford, Robyn L.</td>
<td>University of Dayton</td>
<td>15</td>
</tr>
<tr>
<td>Burba, Micheal E.</td>
<td>University of Dayton</td>
<td>16</td>
</tr>
<tr>
<td>Cotto-Figueroa, Desirée</td>
<td>Ohio University</td>
<td>8-9</td>
</tr>
<tr>
<td>Gerlach, Adam R.</td>
<td>University of Cincinnati</td>
<td>11</td>
</tr>
<tr>
<td>Heeb, Nicholas S.</td>
<td>University of Cincinnati</td>
<td>12</td>
</tr>
<tr>
<td>Kirievich, Krista M.</td>
<td>University of Cincinnati</td>
<td>13</td>
</tr>
<tr>
<td>Knapke, Robert D.</td>
<td>University of Cincinnati</td>
<td>14</td>
</tr>
<tr>
<td>McGee, Myron'Tyshan L.</td>
<td>University of Dayton</td>
<td>17</td>
</tr>
<tr>
<td>Morris, Nathaniel J.</td>
<td>The Ohio State University</td>
<td>10</td>
</tr>
</tbody>
</table>

**Scholars**

<table>
<thead>
<tr>
<th>Name</th>
<th>College/University</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adams, Christopher A.</td>
<td>Wilberforce University</td>
<td>76</td>
</tr>
<tr>
<td>Amling, Malia B.</td>
<td>Cedarville University</td>
<td>25</td>
</tr>
<tr>
<td>Battista, Calia A.</td>
<td>The University of Akron</td>
<td>55</td>
</tr>
<tr>
<td>Black, Adam O.</td>
<td>Ohio Northern University</td>
<td>46</td>
</tr>
<tr>
<td>Black, Winston L., II</td>
<td>University of Dayton</td>
<td>73</td>
</tr>
<tr>
<td>Boothe, Matthew C.</td>
<td>Marietta College</td>
<td>35-36</td>
</tr>
<tr>
<td>Bourne, Harrison W.</td>
<td>Miami University</td>
<td>40</td>
</tr>
<tr>
<td>Brooks, Chellvie L.</td>
<td>Central State University</td>
<td>27</td>
</tr>
<tr>
<td>Brooks, Donielle E.</td>
<td>Central State University</td>
<td>30</td>
</tr>
<tr>
<td>Burse-Wooten, Beatrice M.</td>
<td>Central State University</td>
<td>28</td>
</tr>
<tr>
<td>Chrzanowski, David M.</td>
<td>Case Western Reserve University</td>
<td>20</td>
</tr>
<tr>
<td>Conant, Ian A.</td>
<td>Cleveland State University</td>
<td>32</td>
</tr>
<tr>
<td>Croston, Michael E.</td>
<td>The University of Akron</td>
<td>54</td>
</tr>
<tr>
<td>Daniell, Benjamin W.</td>
<td>Marietta College</td>
<td>37</td>
</tr>
<tr>
<td>Dewald, Andrew S.</td>
<td>Ohio University</td>
<td>49</td>
</tr>
<tr>
<td>Ernst, Meike H.</td>
<td>Case Western Reserve University</td>
<td>18</td>
</tr>
<tr>
<td>Fuerst, Eric M.</td>
<td>University of Dayton</td>
<td>74</td>
</tr>
<tr>
<td>Hammock, Marie A.</td>
<td>Wright State University</td>
<td>79</td>
</tr>
<tr>
<td>Hansford, Samuel E.</td>
<td>The Ohio State University</td>
<td>51</td>
</tr>
<tr>
<td>Harriman, Daniel J.</td>
<td>University of Cincinnati</td>
<td>63</td>
</tr>
<tr>
<td>Hatcher, Kevin M.</td>
<td>Wright State University</td>
<td>80</td>
</tr>
<tr>
<td>Hathaway, Drew N.</td>
<td>Miami University</td>
<td>42</td>
</tr>
<tr>
<td>Holl, Martin A.</td>
<td>Youngstown State University</td>
<td>84</td>
</tr>
<tr>
<td>Hoyte, Ashley C.</td>
<td>Kent State University</td>
<td>34</td>
</tr>
<tr>
<td>Huffman, Matthew D.</td>
<td>Miami University</td>
<td>41</td>
</tr>
<tr>
<td>Johnson, Dahrion D.</td>
<td>Wilberforce University</td>
<td>78</td>
</tr>
<tr>
<td>Jones, Nicholas S.</td>
<td>Ohio Northern University</td>
<td>44</td>
</tr>
<tr>
<td>Scholars</td>
<td>College/University</td>
<td>Page(s)</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Kakish, Carmen Z.</td>
<td>Case Western Reserve University</td>
<td>.19</td>
</tr>
<tr>
<td>Kendall, Isaiah A.</td>
<td>Wright State University</td>
<td>.81</td>
</tr>
<tr>
<td>Kingen, Logan M.</td>
<td>Ohio Northern University</td>
<td>.45</td>
</tr>
<tr>
<td>Krueger, Austin M.</td>
<td>Cedarville University</td>
<td>.26</td>
</tr>
<tr>
<td>Kubas, George D.</td>
<td>Youngstown State University</td>
<td>.83</td>
</tr>
<tr>
<td>Lewis, James B.</td>
<td>The Ohio State University</td>
<td>.52</td>
</tr>
<tr>
<td>Lucas, Jeffrey H.</td>
<td>Marietta College</td>
<td>.38</td>
</tr>
<tr>
<td>Macmann, Owen B. R.</td>
<td>University of Cincinnati</td>
<td>.69</td>
</tr>
<tr>
<td>Marone, Stephen J.</td>
<td>The University of Toledo</td>
<td>.61</td>
</tr>
<tr>
<td>McGee, Amanda G.</td>
<td>University of Cincinnati</td>
<td>.64-65</td>
</tr>
<tr>
<td>Mitchell, Sophia M.</td>
<td>University of Cincinnati</td>
<td>.70</td>
</tr>
<tr>
<td>Montion, Joseph P.</td>
<td>The University of Toledo</td>
<td>.59</td>
</tr>
<tr>
<td>Morton, James T.</td>
<td>Miami University</td>
<td>.43</td>
</tr>
<tr>
<td>Muff, Derek E.</td>
<td>Case Western Reserve University</td>
<td>.21</td>
</tr>
<tr>
<td>Mullins, Teisha L.</td>
<td>Cleveland State University</td>
<td>.33</td>
</tr>
<tr>
<td>Nichols, Justin S.</td>
<td>Cedarville University</td>
<td>.23</td>
</tr>
<tr>
<td>Onacila, Eric C.</td>
<td>Marietta College</td>
<td>.39</td>
</tr>
<tr>
<td>Payton, Athena L.</td>
<td>The University of Akron</td>
<td>.56</td>
</tr>
<tr>
<td>Roberts, Dominique N.</td>
<td>Central State University</td>
<td>.29</td>
</tr>
<tr>
<td>Schwartz, Nicholas J.</td>
<td>University of Cincinnati</td>
<td>71-72</td>
</tr>
<tr>
<td>Singhal, Achal S.</td>
<td>The Ohio State University</td>
<td>.53</td>
</tr>
<tr>
<td>Smith, Kenneth W., Jr.</td>
<td>The University of Akron</td>
<td>57-58</td>
</tr>
<tr>
<td>Sollmann, Leslie A.</td>
<td>University of Dayton</td>
<td>.75</td>
</tr>
<tr>
<td>Stapleton, Dakota J.</td>
<td>Ohio University</td>
<td>.48</td>
</tr>
<tr>
<td>Starr, Andrew F.</td>
<td>Ohio Northern University</td>
<td>.47</td>
</tr>
<tr>
<td>Tyler, Rakim M.</td>
<td>Central State University</td>
<td>.31</td>
</tr>
<tr>
<td>Vick, Tyler J.</td>
<td>University of Cincinnati</td>
<td>66-67</td>
</tr>
<tr>
<td>Walker, Alex R.</td>
<td>University of Cincinnati</td>
<td>.68</td>
</tr>
<tr>
<td>Watson, Erkai L.</td>
<td>Cedarville University</td>
<td>.24</td>
</tr>
<tr>
<td>Weaver, Matthew B.</td>
<td>Ohio University</td>
<td>.50</td>
</tr>
<tr>
<td>Wilkewitz, Brittany M.</td>
<td>The University of Toledo</td>
<td>.62</td>
</tr>
<tr>
<td>Will, John A.</td>
<td>Wright State University</td>
<td>.82</td>
</tr>
<tr>
<td>Williams, Mahogany M.</td>
<td>Wilberforce University</td>
<td>.77</td>
</tr>
<tr>
<td>Wu, Dora</td>
<td>Case Western Reserve University</td>
<td>.22</td>
</tr>
<tr>
<td>Young, Taurean J.</td>
<td>The University of Toledo</td>
<td>.60</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Community College Scholars</th>
<th>Community College</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compaleo, Joshua D.</td>
<td>Sinclair Community College</td>
<td>.87</td>
</tr>
<tr>
<td>Conley, Darren M.</td>
<td>Columbus State Community College</td>
<td>.85</td>
</tr>
<tr>
<td>Solmni, Rackvin</td>
<td>Sinclair Community College</td>
<td>.88</td>
</tr>
<tr>
<td>Stover, Nathan R.</td>
<td>Sinclair Community College</td>
<td>.89</td>
</tr>
<tr>
<td>Waldie, Sharon L.</td>
<td>Columbus State Community College</td>
<td>.86</td>
</tr>
<tr>
<td>Education Scholars</td>
<td>College/University</td>
<td>Page(s)</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Banks, Josiah M.</td>
<td>Youngstown State University</td>
<td>108</td>
</tr>
<tr>
<td>Burkman, Katherine A.</td>
<td>University of Dayton</td>
<td>104</td>
</tr>
<tr>
<td>Cherry, Elisa A.</td>
<td>Cedarville University</td>
<td>90</td>
</tr>
<tr>
<td>Demarse, Maggie F.</td>
<td>Wright State University</td>
<td>106</td>
</tr>
<tr>
<td>DuLaney, Kerry E.</td>
<td>Ohio Northern University</td>
<td>100</td>
</tr>
<tr>
<td>Gollman, LaKeyia S.</td>
<td>Central State University</td>
<td>92</td>
</tr>
<tr>
<td>Miller, Caroline I.</td>
<td>Miami University</td>
<td>99</td>
</tr>
<tr>
<td>Nagel Koeller, Kathan M.</td>
<td>Wright State University</td>
<td>107</td>
</tr>
<tr>
<td>Richards, Douglas L.</td>
<td>Central State University</td>
<td>93</td>
</tr>
<tr>
<td>Schaefer, Allison M.</td>
<td>Cedarville University</td>
<td>91</td>
</tr>
<tr>
<td>Smith, Kaihla L.</td>
<td>Kent State University</td>
<td>94-98</td>
</tr>
<tr>
<td>Solomon, Steven E.</td>
<td>The University of Toledo</td>
<td>102</td>
</tr>
<tr>
<td>Steinberger, Thomas E.</td>
<td>Ohio Northern University</td>
<td>101</td>
</tr>
<tr>
<td>Tran, Paul T.</td>
<td>University of Cincinnati</td>
<td>103</td>
</tr>
<tr>
<td>Yacovoni, Erin M.</td>
<td>University of Dayton</td>
<td>105</td>
</tr>
</tbody>
</table>
The Ohio Space Grant Consortium (OSGC), a member of the NASA National Space Grant College and Fellowship Program, awards graduate fellowships and undergraduate scholarships to students working toward degrees in Science, Technology, Engineering and Mathematics (STEM) disciplines at OSGC-member universities. The awards are made to United States citizens, and the students are competitively selected. Since the inception of the program in 1989, over 900 undergraduate scholarships and 150 graduate fellowships have been awarded.

Matching funds are provided by the member universities, the Ohio Aerospace Institute (OAI), Choose Ohio First, the Nord Family Foundation, the Nordson Corporation Foundation, and private industry. Note that this year approximately $530,000 will be directed to scholarships and fellowships representing contributions from NASA, the Ohio Aerospace Institute, member universities, foundations, and industry.

By helping more students to graduate with STEM-related degrees, OSGC provides more qualified technical employees to industry. At the Doctoral level, students have a government co-advisor in addition to their faculty mentor, and perform research at one of the following Ohio federal laboratories: NASA Glenn Research Center or the Air Force Research Laboratory at Wright-Patterson Air Force Base. The research conducted for the Master’s and Doctoral degrees must be of interest to NASA. A prime aspect of the scholarship program is the undergraduate research project that the student performs under the mentorship of a faculty member. This research experience is effective in encouraging U. S. undergraduate students to attend graduate school in STEM. The Education scholarship recipients are required to attend a workshop conducted by NASA personnel where they are exposed to NASA educational materials and create a lesson plan for use in their future classrooms.

**Affiliate Members**
- Air Force Institute of Technology
- The University of Akron
- Case Western Reserve University
- Cedarville University
- Central State University
- Cleveland State University
- University of Dayton
- Miami University
- Ohio Northern University
- The Ohio State University
- Ohio University
- University of Cincinnati
- The University of Toledo
- Wilberforce University
- Wright State University

**Participating Universities**
- Kent State University
- Marietta College
- Youngstown State University

**Community Colleges**
- Columbus State Community College
- Cuyahoga Community College
- Lakeland Community College
- Lorain County Community College
- Owens Community College
- Sinclair Community College
- Terra State Community College

Ohio Space Grant Consortium • 22800 Cedar Point Road • Cleveland, Ohio 44142

http://www.osgc.org/
**MEMBERSHIP**

**Management**

**Dr. Gary L. Slater**  
Director  
Ohio Space Grant Consortium  
University of Cincinnati

**Ms. Laura A. Stacko**  
Program Manager  
Ohio Space Grant Consortium

**Dr. P. Ruby Mawasha, P.E.**  
Associate Director  
Ohio Space Grant Consortium  
Wright State University

**Mr. Timothy M. Hale**  
Program Assistant  
Ohio Space Grant Consortium

**Member Institutions**

**Dr. Jonathan T. Black**  
Air Force Institute of Technology

**Dr. Jaikrishnan R. Kadambi**  
Case Western Reserve University

**Dr. Robert Chasnov, P. E.**  
Cedarville University

**Mr. Clark Fuller**  
Central State University

**Ms. Pamela C. Charity-Leek**  
Cleveland State University

**Dr. Timothy Cameron**  
Miami University

**Dr. Jed E. Marquart, P. E.**  
Ohio Northern University

**Dr. Füsun Özgüner**  
The Ohio State University

**Dr. Shawn Ostermann**  
Ohio University

**Dr. Craig C. Menzemer**  
The University of Akron

**Dr. Kelly Cohen**  
University of Cincinnati

**Dr. John G. Weber**  
University of Dayton

**Dr. Lesley M. Berhan**  
The University of Toledo

**Dr. Edward Asikele**  
Wilberforce University

**Dr. P. Ruby Mawasha**  
Wright State University

**Participating Institutions**

**Dr. Ben W. Ebenhack**  
Marietta College

**Dr. Hazel Marie**  
Youngstown State University

**Community Colleges**

**Professor Jeffery M. Woodson**  
Columbus State Community College

**Dr. David Frazee**  
Cuyahoga Community College

**Dr. Margaret F. Bartow**  
Lakeland Community College

**Dr. George Pillainayagam**  
Lorain County Community College

**Dr. Renay Scott**  
Owens Community College

**Mr. Kent Wingate**  
Sinclair Community College

**Dr. James Bighouse**  
Terra Community College

**Financial Supporters**

- Choose Ohio First
- Cornerstone Research Group, Inc.
- Etegent Technologies
- L-3 Cincinnati Electronics
- Nord Family Foundation
- Nordson Corporation Foundation
- Orbital Research, Inc.
- ZIN Technologies, Inc.

**Lead Institution**

**Ms. Ann O. Heyward**  
Ohio Aerospace Institute

**Government Liaisons**

**Ms. Darla J. Jones**  
NASA Glenn Research Center

**Dr. M. David Kankam**  
NASA Glenn Research Center

**Ms. Susan M. Kohler**  
NASA Glenn Research Center

**Ms. Dovie E. Lacey**  
NASA Glenn Research Center

**Ms. Kathleen A. Levine**  
Wright-Patterson Air Force Base

**Ms. Alice Fay Noble**  
Wright-Patterson Air Force Base

**Ms. Kathleen Schweinfurth**  
Wright-Patterson Air Force Base

**Education Outreach Partners**

**Mr. Constantine Regas**  
Cincinnati Observatory Center

**Ms. Pamela Bowers**  
Drake Planetarium & Science Center

**Ms. Linda A. Neenan**  
iSPACE, Inc.

**Dr. Jay N. Reynolds**  
Cleveland State University
OHIO CONGRESSIONAL MAP

Ohio Congressional Districts 2012-2022
(As Adopted 2012)

Source: http://www.sos.state.oh.us/sos/upload/reshape/congressional/Congressional-Statewide.pdf
FELLOWS
Desireé Cotto-Figueroa

**Status:** Doctoral 2, Astrophysics

**Research Topic:** Radiation Recoil Effects on the Dynamical Evolution of Asteroids

**Advisor(s):** Thomas S. Statler

**Biography:** I have always shown a great interest in science and mathematics and by the time that I was in high school, I knew that astronomy was my passion. As an undergraduate student in the University of Puerto Rico, I was a NASA Puerto Rico Space Grant Consortium Fellow and conducted a research project about measurements of separation and position angle of binary stars. For the summer of 2005 I was selected for a R.E.U. program at the University of Hawaii to study the habitability of the 55 Cancri extrasolar planetary system. I graduated Cum Laude from the University of Puerto Rico in 2006 with a B.S. degree in Applied Physics (Electronics). In 2008 I obtained a M.S. degree in Astrophysics from Ohio University with a thesis title "The Rotation Rate Distribution of Near-Earth Asteroids (NEAs)". Currently, I'm a Ph.D. candidate at Ohio University. I was a NASA Jenkins Predoctoral Fellow from 2008 to 2011 and had the enlightening opportunity of working at the Jet Propulsion Laboratory to study radiation recoil effects on orbits of NEAs. Astronomy will always be a great passion for me, one that motivates me to continue studying and to give more of myself, not only at the academic level but also on the professional level. I know that being an Ohio Space Grant Consortium Fellow together with my efforts and determination will take me to my goal of obtaining my Ph.D. degree. Once I finish my graduate studies I want to be a Post Doctoral Researcher, preferably at a NASA center, in order to expand my knowledge, further develop my skills and accomplish my ultimate goal of being a Professor and a Research Advisor.

**Abstract:** Radiation recoil forces are caused by the anisotropic emission of thermal photons from the surface of a rotating object that is heated by sunlight. The Yarkovsky effect is a radiation recoil force that results in a semimajor axis drift in the orbit that can cause main belt asteroids to be delivered to powerful resonances from which they could be transported to Earth-crossing orbits. This force depends on the spin state of the object, which is modified by the YORP effect, a variation of the Yarkovsky effect that results in a change of the spin rate and obliquity (i.e. the angle between the orbital plane and the spin axis of the object). The YORP effect should leave a distinctive signature, driving the spin axis of most asteroids to obliquity values of 0, 90 and 180 degrees. But to obtain a direct measurement of their distribution of obliquities is not an easy task. To determine the rotation poles of asteroids will require radar observations or multiple lightcurves at different illumination and orbital phases for each NEA. So far, there are only about 20 NEAs for which a rotation pole has been determined. Instead of obtaining a direct measurement, the obliquity of an NEA can be inferred if the semimajor axis drift rate due to the Yarkovsky effect is known since from the linear heat diffusion theory for a spherical body, the semimajor axis drift rate varies linearly with cosine obliquity. I estimated the semimajor axis drift rates for a sample of 801 NEAs using the Jet Propulsion Laboratory Comet and Asteroid Precision Orbit Determination Package.

*Continued on the Next Page...*
Abstract: (Continued)
Although there is a simple dependence between the semimajor axis drift rate and the obliquity, the true scenario is more complicated since for the great majority of NEAs, there is no information available about their physical characteristics. One of the goals of my dissertation is to develop a code that will explore a wide variety of models for the distribution of obliquities of the NEAs in order to identify the intrinsic obliquity distribution that is consistent with the semimajor axis drift rates obtained for the sample of 801 NEAs. If the distribution shows that the obliquities of the asteroids tend towards 0, 90 and 180 degrees, it would be supporting evidence for the significance of the YORP effect as the main physical process in the evolution of NEAs. This research will contribute to the understanding of radiation recoil forces, which are dominant physical processes in the evolution of NEAs. It will address the nature of the origin and evolution of NEAs and therefore to the origin and evolution of our Solar System since NEAs are the pieces left over from the formation of the inner planets.

Publications:
Status: Master’s 1, Electrical Engineering
Research Topic: Android Smartphone Power Management

Advisor(s): Dr. Xiaorui Wang

Biography: Nathaniel J. Morris graduated from Trotwood Madison High School in Dayton as the Valedictorian. He is currently studying Electrical and Computer Engineering at The Ohio State University. He will graduate in May 2014 with a Master’s Degree in Electrical Engineering and plans to continue his PHD at The Ohio State University. He belongs to professional organizations such as NSBE (National Society for Black Engineers), SME (Society for Manufacturing Engineers), and the STEM (Science Technology Engineering and Math) Club. He participates in these clubs/organizations to increase his professional development and understanding about the engineer profession.

In the Summer of 2009 his research involved using classical physics and frustrated total internal reflection to produce a multi-touch system. During the summer of 2010 he interned as a manufacturing engineer at ATK (Alliant Tech Systems), manufacturing antennas and radomes. Additionally, he was privileged to work on the MPS (Master Production schedule), Process Standards, digital database, Quality Audits, and including the CAPEP program hosted at Central State University; A college prep-program for high school students entering the STEM fields. In 2012 his research was focused on a high altitude payload that record imagery data to aid in a geospatial analysis. The geospatial analysis is targeted toward the effects of wildfires on vegetation. In addition, during the Summer of 2012 he had the pleasure to participate in the NASA Academy program. His research involved the integration of a self-diagnostic accelerometer on a C-17’s engine. This accelerometer along with a fusion of other sensors was proposed to increase safety and reliability for commercial and military aircraft. Currently, his work involves power management techniques for embedded systems such as Android smartphones. The goal of the research is to extend the battery life of Android smartphones by utilizing a live migration technique to initiate a deep sleep mode.

Abstract: Extending the battery life of a smartphone is a growing demand. The average smartphone has a high technology density. Technology density comes with a cost and this cost is more power consumption. The technology of a battery has a long way to come before it can meet the demands of modern mobile devices. Instead of increasing the battery capacity, a great way to extend battery life is through additional state of the art software power management approaches. Traditional software approaches places the smartphone into a deep sleep mode during inactivity. This same approach can be used when a user is engaged with a personal computer. When the user is focused on the computer, it would be a great opportunity to send the smartphone in a low power mode. The power management technique interfaces with the computer to allow the user access to the smartphone’s image, while the physical one is conserving energy. The virtual smartphone present on the computer offers the user any soft features. The major feature that is not possible to virtualize is the cellular communication. Therefore, this technique is another opportunity for the smartphone to change into a low power mode and naturally extend the usable battery life.

Publications: None yet.

Congressional District: 10th
Congressional Representative: Michael R. Turner
Adam R. Gerlach

**Status:** Doctoral 3, Aerospace Engineering

**Research Topic:** Trajectory Tracking by Approximate Inverse Dynamics

**Advisor(s):** Dr. Bruce K. Walker

**Biography:** My interests in engineering were developed at a very young age. My father owned a machine shop that did high production machining for the automotive industry along with custom tool and die development. I spent countless hours watching him solve real-world engineering problems. When it came time for me to make decisions on pursuing a college education, I decided that I wanted to work at the cutting edge of technology and thought a degree in Aerospace Engineering at the University of Cincinnati was the best avenue to reach that goal.

While an undergraduate student at the University of Cincinnati, I completed the cooperative education program by working as a spacecraft propulsion engineer at the Naval Research Laboratory (NRL) in Washington DC. At the NRL, I had the unique opportunity to contribute to the design, development, analysis, build, test, and flight operations of the propulsion system of a new experimental upper stage for the MiTEx program. As a senior, three fellow classmates and I were selected by NASA to perform an autonomous rendezvous and capture robotics experiment on NASA’s ‘Weightless Wonder’ as part of the NASA Microgravity University Program. The work performed on that experiment has fueled my interests in my current graduate research at the University of Cincinnati.

**Abstract:** Trajectory planning is the process of planning a desired path for an autonomous system that takes into consideration the dynamics and differential constraints of the system at hand. Because of this, trajectory planning algorithms must develop its path in the input-space of the system as opposed to its state-space as in traditional path planning algorithms. However, it is difficult to represent initial and goal states as well as obstacles in the input-space of the system. Many trajectory planning algorithms use a finite number of discrete motion primitives in order to relate the state-space of a system to its input-space. Unfortunately, developing these motion primitives can be complex and they can lead to sub-optimal solutions. An obvious need exists for a method to relate the state-space to the input-state of the system of interest that does not rely on the design of motion primitives.

The primary contribution of this research is the development of an algorithm specifically designed to relate the state-space to the input-space of a system of interest without relying on the design of motion primitives as motivated by the trajectory planning literature. This algorithm exploits the best approximation property of radial basis functions to accurately approximate the inverse dynamics of the system of interest.

**Publications:**
Biography: I earned my undergraduate degree in Aerospace Engineering from the University of Cincinnati in 2008. During my studies I had the opportunity to partake in the cooperative education program where I tailored my involvement towards research to ensure pursuing a graduate degree was a good fit for me. The majority of my experiences were at the Air Force Research Labs in the Propulsion Directorate working on computations involving scramjet engine paths. I also used coop as an opportunity to study abroad in Germany at the Technische Universität Berlin, where I helped research lean blowout of swirl stabilized combustors.

These experiences confirmed my interest in research and reinforced my desire to attend graduate school and helped me decide to begin a direct PhD program upon graduation. During my graduate studies I’ve primarily focused on experimental investigations of supersonic jet noise reduction, though a large portion of my work has been collaborating with colleagues at the Office of Naval Research (ONR) with the purpose of validating their computational fluid dynamics code. My work was part of a project sponsored by Strategic Environmental Research and Development Program (SERDP WP-1584) and was instrumental in securing a Naval Research Labs Broad Agency Agreement titled Fundamental Jet Noise Reduction Science and Technology-Validation Experiments.

Abstract: High performance military aircraft generate large amplitudes of noise that negatively impact individuals and communities. Flight line personnel, especially those on aircraft carriers, have a definite chance of developing noise induced hearing loss and/or tinnitus due to their close proximity to the jets at takeoff and landing. Adverse health effects have also been linked to nighttime flyovers in communities surrounding airfields. This research focuses on advanced noise reduction technologies, specifically chevrons and fluidic injection, to mitigate these issues.

Appreciable decreases have already been achieved with each of these devices, but the ever increasing noise issue requires additional reductions to be sought. To this end, the research involves geometric refinement of the technologies, particularly investigating the effect of azimuthal arrangement. Preliminary results indicate improved noise reduction with less theoretical performance losses.

Publications:
Biography: I am currently working on my Master’s Degree as an Aerospace Engineering ACCEND student at the University of Cincinnati (UC). During five of my undergraduate co-op quarters, I worked at General Electric Aviation in Evendale, Ohio in various roles such as engine life management, airfoils sourcing, powerplant engineering, CFM56 engine assembly, and CF6 engine product support engineering. Also, I started participating in research during the summer after my freshmen year as a part of UC’s Women in Science and Engineering (WISE) program researching supersonic inlet flow control. Then during my fourth year, I participated in wind turbine computational fluid dynamics (CFD) studies. My co-op rotations at GE Aviation combined with my undergraduate coursework spurred my interest in fluids and propulsion. Thus, my research focus for my masters is aircraft propulsion and turbomachinery. For my master’s thesis, I am researching improved CFD methods to aid in compressor off-design modeling as a part of GE Aviation’s USA program.

Abstract: This research project’s main objective is to develop efficient design methods in order to include unsteady flow effects into turbomachinery design. Blade tip vortices and upstream wakes in turbomachinery engines have a significant role in the near stall behavior of compressors. This role of unsteady flow effects were demonstrated by the previous work performed by the University of Cincinnati (UC) Compressor Off-Design Modeling program. Because of the importance of unsteady effects in compressor near-stall conditions, there is a need to model unsteadiness in compressor computational fluid dynamics (CFD) simulations. However, the CFD simulations of unsteadiness in turbomachinery are computationally very expensive. Thus, a more efficient method to model unsteady behavior in turbomachinery is desired.

The objective is to establish a time efficient method to model unsteady behavior in turbomachinery compressors for use early in the design process. This method involves numerical simulations of compressor stages where the stator domain is run as a steady flow and the adjacent downstream rotor domain is modeled using an unsteady approach. Thus, this method is referred to as the mixed-multistage analysis technique. This research is performed at UC’s Gas Turbine Simulation Laboratory (GTSL) Center Hill facility and at GE Aviation (GEA) under the guidance of Dr. Paul Orkwis (UC professor). The computation tools for this research include: GEA’s in-house CFD solver and other proprietary GEA codes.

Mixed-multistage numerical simulations of the low-speed research compressor (LSRC) stages were performed to determine the accuracy, efficiency, and feasibility of the technique. This mixed-multistage technique utilizes a RANS solver in both the steady-state stator domain and a time-accurate rotor domain. These simulations will be compared to experimental data and baseline steady state multistage simulations at design point and near-stall conditions. Future work will begin to conduct research using transonic compressor stages at multiple operating conditions.

Publications: None yet.
Robert D. Knapke

Status: Doctoral 2, Fluids, Aerospace Engineering
Research Topic: Harmonic Balance and Conjugate Heat Transfer Methods for Turbomachinery Simulations
Advisor(s): Mark G. Turner, Ph.D.

Biography: I am currently a Doctoral student at the University of Cincinnati. Ever since grade school I have had an interest in math and science. During high school, I realized that I enjoyed Physics and found Aerospace Engineering to be a good combination of interesting Physics and difficult math problems. Because of the co-op program offered and the excellent Aerospace program, I decided to attend the University of Cincinnati.

Throughout my first few co-op quarters, I found the research aspect of engineering to be the most interesting. At the University of Cincinnati Gas Turbine Simulation Laboratory (GTSL), I began research of various Computational Fluid Dynamics (CFD) topics and found that area of study was a good fit for my interests. Throughout my remaining co-op experiences and my Master’s research, I have worked on a variety of projects related to CFD and applications to turbomachinery simulations. These projects include experiments of a Micro Machine Gas Turbine, simulations of a Counter-Rotating Aspirated Compressor and simulations of a cooled high pressure turbine.

Abstract: During the design process of turbomachinery parts, several levels of fidelity are used. The most detailed step is the use of 3D, viscous, turbulent CFD of the design. Currently, the common practice in industry involves the use of steady simulations, rather than capturing the unsteady nature of the problem. The reason for this simplification is the high computational cost of time accurate simulations. Another common simplification is the use of adiabatic thermal wall boundary conditions, which neglects the complex heat transfer. The use of iso-thermal walls allows for some improvement, but still involves simplifications of the wall heat transfer.

The goal of this research is to implement both the time-dependent and heat transfer physics into a University of Cincinnati in-house CFD solver. The unsteady flow physics will be captured using the Harmonic Balance method. This method takes advantage of the periodic nature of turbomachinery to reduce the computational cost while capturing the majority of the unsteadiness. In addition, the conjugate heat transfer model will be added to the solver. This model involves solving the energy equation through the solid material and connecting the solid and fluid domains as one calculation. Capturing the unsteady and heat transfer physics of turbomachinery in a cost efficient manner would improve the design process.

Publications:
Robyn L. Bradford

Status: Master’s 2, Materials Engineering
Research Topic: Fabricating Electrospun CNF-Doped Poly(vinyl alcohol) Anofibers for use as Tissue Engineering Scaffolds
Advisor(s): Khalid Lafdi, Ph.D.

Biography: I am a second year graduate student at the University of Dayton (UD) in the combined Master’s/Doctoral program in Materials Engineering. I’m also completing my second year as President of Ideation for Flyer Innovations, a cross-disciplinary student group aimed at promoting innovation, technology and entrepreneurship through participation in engineering design competitions. This year, my team is competing in UD’s Business Plan Competition with a dynamic new mobile application for iPhone and Android phones. Out of 114 entries, we were selected as 1 of 5 finalists to advance to the third and final round. My other activities include being a NASA Student Ambassador, an active member of the NASA Academy Alumni Association and serving as the Graduate Student Senator for UD’s Academic Senate.

Prior to my matriculation to UD, I attended Central State University where I received my Bachelor of Science degree in manufacturing engineering. While at Central State, I held several leadership positions with the National Society of Black Engineers (NSBE) and the Society of Manufacturing Engineers (SME). I also interned with the Air Force Research Lab (AFRL) at Wright-Patterson Air Force Base (WPAFB); The Boeing Company in Seattle, Washington; and NASA Glenn Research Center in Cleveland, Ohio.

Abstract: Tissue engineering (TE), also known as regenerative medicine, is a multidisciplinary research field that combines engineering, medicine and the natural and life sciences in order to regenerate damaged tissues and restore normal function to organs. It is a promising alternative to traditional transplant surgeries used to treat complex and life-threatening conditions brought on by disease or severe injury. One TE method uses electrospun polymer fibers as support structures called scaffolds to simulate the extracellular matrix (ECM). Coupled with appropriate growth factors/biological cues, cells are seeded onto the biodegradable scaffolds and cultured in vitro to generate new tissue that is referred to as a tissue engineered construct (TEC). The TEC is then implanted into the site of injury to facilitate healing. The purpose of this research is to model and optimize cellular interaction with the fibrous scaffold. This will be done by designing for surface features that maximize surface area and by monitoring fiber orientation during the electrospinning process.

Publications:
Biography: My collegiate career began by attending Central State University from which I graduated Summa Cum Laude in May of 2009 with a Bachelor of Science Degree in Manufacturing Engineering. While attending Central State University, I had the opportunity to conduct research at the Air Force Research Laboratory (AFRL) at Wright-Patterson Air Force Base (WPAFB) beginning the summer following my freshman year. My research was conducted in the Materials and Manufacturing Directorate in the Materials Processing Section. Following my first year of research, I transitioned to the Life Prediction Section where I have remained to this day. Following graduation from Central State University, I married my wife, Lauren.

Working at AFRL led me to pursue a graduate degree in Materials Engineering at the University of Dayton. I am currently in the combined Master’s/Doctoral Program in the Materials Engineering Department. I spent my first three years in the program completing the required course objectives while working on several different research projects at AFRL. During the last year of coursework, my wife and I had our first child, Judah, who will be 18 months old by the time this is published. I am now beginning my first year of research of my Doctoral thesis.

Abstract: Although numerous industries employ shot peening on metallic components to achieve enhanced fatigue lifetimes, design life calculations typically do not incorporate the beneficial effects of compressive surface residual stresses. As integrated computational materials engineering (ICME) practices take hold within the industrial base, there is a need for computational tools that predict the influence of surface residual stress on location-specific material behavior. This study focuses on the influence of microstructure (γ grain size, γ’ precipitate size and volume fraction) on the residual stress relaxation of a P/M Ni-base superalloy under creep-fatigue loading. Tensile, cyclic stress-strain, thermal relaxation, and creep behaviors will be characterized for three microstructural conditions of an IN100 alloy with average γ grain sizes of roughly 3, 25, and 60 μm. Initial results from microstructural characterization and thermal relaxation will be presented for this study, which is supporting a foundational engineering problem (FEP) in ICME being pursued by the Materials and Manufacturing Directorate at the Air Force Research Laboratory.

Publications:
### Biography:
Myron’Tyshan McGee a native of Dayton, Ohio, was born September 20, 1989. He graduated from Trotwood Madison High School in 2007. He graduated from Central State University in May, 2012, with a Bachelor’s Degree in Manufacturing Engineering. He is currently attending the University of Dayton pursuing his Master’s in Materials Engineering.

### Abstract:
A key element in the current direct digital manufacturing (DDM) technologies is fused deposition modeling (FDM). Significant needs exist in the areas of materials development as well as process modeling for the FDM process. This project will begin to address those needs. In doing so, two primary and interrelated goals will be pursued:

1.) Development of a cross-linked, carbon-fiber composite materials for FDM;
2.) Establishment of first generation models to relate FDM process parameters to the properties of resulting FDM parts.

The materials development project will be pursued first. The cross-linked composite material will be based on Nylon. Initial experimental work in developing process modeling capability will be carried out on ABS, and neat Nylon-12. Once a workable base formulation of cross-linked composite material is established, it too will be utilized in process modeling experiments.

### Publications:
None yet.
SCHOLARS
Biography: I am an Aerospace and Mechanical Engineering major at Case Western Reserve University. I spent the last two summers as a Senior in Mechanical and Aerospace Engineering at Case Western Reserve University (CWRU), and will graduate in May 2013. I intend to pursue a Master's and a Doctoral Degree in Mechanical Engineering, with focus on fluid mechanics. What I like about fluid mechanics is the combination of physics, modeling, and design it entails: information gained on how a fluid behaves can subsequently be used to model that fluid in computer simulations, and to improve the design of devices interacting with that fluid, such as the ionic pumps described below. I am currently a member of the Case Baja Team (college competition to construct an off-road vehicle), and I have spent the past three summers working in the Case Center for Biologically Inspired Robotics Research (a.k.a. the Case Biorobotics Lab). I enjoy both activities immensely because they allow me to get hands-on experience in machining. I look forward to finding similarly engaging and instructive work in graduate school.

Abstract: The objective of this research is to graph the flow field generated by ionic wind pumps. The purpose of these pumps is to move air in order to cool microelectronics [1]. The air moves because it is ionized at the tip of the emitter electrode of the pump, and then a voltage is applied such as to attract the ionized air particles to the two collector electrodes (one on each side of the emitter) [1]. The experiments conducted measure the flow fields in 3 ionic pumps when they are turned on (at various voltages), and when they are turned off [2]. The measurements are taken using PIV (particle image velocimetry): air containing oil droplets is pushed through the pump, and those droplets, which follow the motion of the air, are photographed every 4 μs [2,3]. Comparing pairs of images using cross correlation allows the change in distance of the oil particles between images to be measured, from which, knowing the time elapsed between photos, the velocity of the particles is calculated [3]. The experiments were conducted in pairs: for each flow field for the pump turned on, there is one with the pump turned off [2]. Subtracting the flow fields for the pump off from those for the pump on shows how the pump affects the air going through it [2]. However, this “difference” flow field does not show the effect the pump would have all by itself in still air: the experiments examine the effect of the pump on moving air [2]. The results of this work can be used as a starting point for testing out design improvements on the pumps [2].

References:

Publications: None yet.
Carmen Z. Kakish

Status: Senior, Biomedical Engineering

Research Topic: Oncology Therapeutics: Hyperthermia Using Self-Heating Micro-particles

Advisor(s): Dr. Alexis Abramson

Biography: I was born in the small country of Jordan in 1991. I lived there for five years until my family immigrated to the United States, specifically Akron, Ohio. Growing up, I attended the Revere School District in Richfield. My interest in Science and Mathematics based courses emerged from the exceptional way in which the teachers at Revere introduced the material to their students. This along with my passion for medicine fueled my decision to study biomedical engineering.

I am currently a Senior at Case Western Reserve University. I am majoring in Biomedical Engineering, specifically in the bioelectric sequence. The connection between engineering and the human body that this major offers greatly interests me. Outside of the classroom, I have become involved in four different organizations on campus: Women in Science and Engineering Roundtable (WISER), Phi Delta Epsilon Medical Fraternity, the Tau Beta Pi Engineering Honor Society, and the Alpha Eta Mu Beta Biomedical Engineering Honor Society. I have been an active participant in each of the organizations, but I dedicate most of my time to WISER. I am currently the vice-president of WISER.

In the future, I hope to enter a medical school, with the hopes of one day becoming a Pediatric Surgeon.

Abstract: Micro-particles composed of Poly-Lactic-Co-Glycolic Acid (PLGA) coated calcium chloride salt are being created for the development of an innovative form of cancer treatment. The proposed treatment involves the in situ delivery of the micro-particles into the intracellular space of a cancerous cell. After extended exposure to the intracellular space of the cancerous cell, the PLGA coating of the micro-particles will dissolve allowing for the exothermic reaction of calcium chloride with water. The release of heat from the reaction will raise the temperature of the cell beyond viable means; thus, causing death of the cancerous cell. Baseline tests measuring heat release and temperature change of the dissolution of calcium chloride with water were conducted using the method of calorimetry in order to understand the thermal behavior of particles. Further analysis of these results should give insight into the amount of calcium chloride embedded in the particle. The next step in the research is to test the thermal behavior of various formulas of particles in order to determine the ideal concentration and type of particle for the project to proceed. Particle degradation experiments will also be conducted in order to better understand the time-release properties of the particles.

Publications: None yet.
David M. Chrzanowski

**Status:** Junior, Mechanical Engineering

**Research Topic:** Objection Detection and Wall Following Contact Sensor for Outdoor Domestic Robot

**Advisor(s):** Dr. Roger Quinn

**Biography:** Hello! My name is David Chrzanowski. I come from a suburb of Cincinnati called Mason, Ohio. There I grew up participating in Boy Scouts, playing in our nationally recognized marching band, and acting in the school’s acclaimed drama program.

Currently I am a third year Mechanical Engineering major at Case Western Reserve with a wide variety of interests. I love learning, teaching, building, and exploring. These interests have led me to a number of opportunities, including a trip to the Dominican Republic to build an aqueduct with the Engineers Without Borders program. Most recently, I have been working with the Biologically Inspired Robotics Team on the development of a commercially viable yard care robot.

**Abstract:** Cockroaches use outstretched antennae to accurately perceive the presence of obstacles and to control walking motion around them. It is believed that this principle could provide a robust solution for both guidance and obstacle avoidance for a variety of mobile robots. It has also been suggested that this application is uniquely well suited for use in autonomous lawn mowing, where contact sensing could be used not only to avoid obstacles, but to closely navigate around them for such purposes as edging.

Building on the work of Cowan (Johns Hopkins, 2005/6), and that of Szczecinski (CWRU, 2011), this project aims to design an antenna system for the CWRU Cutter autonomous robot. The bulk of the project will be design and installation of antenna-like sensors with the capability to measure how far they have been compressed. Once in place, the sensors can then serve as a development platform for additional research on possible specific uses and new algorithms. Work on antenna-style guidance could have implications in a number of robotic fields, including surgical and space repair applications.

**Publications:** None yet.
Derek E. Muff

Status: Junior, Mechanical and Aerospace Engineering
Research Topic: An Analysis of Upward Flame Spread over Corrugated Fiberboard

Advisor(s): Dr. James T’ien

Biography: Derek Muff is a Junior Mechanical and Aerospace Engineering student at Case Western Reserve University. After attending high school in Spring Grove, Pennsylvania, Derek became interested in engineering through internships in the engineering division of a local CNC machine shop and in the Army Aeroflight Dynamics Directorate (AFDD) of the NASA Ames Aeromechanics Branch. Derek soon became interested in combustion and propulsion, which led to a research position in the Computational Combustion Laboratory at Case Western Reserve University. Derek plans to use this research as a foundation for future study or a career built on the design of aerospace propulsion elements.

Abstract: Currently, many commodities are packaged, stored, and shipped in corrugated fiberboard (cardboard) containers. However, little is known about cardboard’s qualities regarding combustion. As an introductory approach to solving this problem, the primary goal of this project is to obtain empirical combustion data for standard 42-26C-42 single-walled corrugated fiberboard that will be used to better define its flammability. Due to the inherent inhomogeneity of cardboard, the easiest way to ascertain its collective properties is to test its two components, linerboard and corrugation, individually and compare the results with samples of complete cardboard.

During the combustion of each of these samples, the key data of interest is a high-definition video stream of the flame spread over the surface of the sample, which is utilized to determine flame and pyrolysis propagation rates. In conjunction with the video, time-synchronized mass and temperature measurements provide additional data to correlate with the analyzed propagation rates.

Additionally, by reducing combustion parameters to their simplest state, namely via one-sided burning over fixed-width samples for upward flame spread cases, the effects of controlled alterations of boundary conditions and cardboard orientation are easily discernible. The comparison of these data with standard orientation and individual component combustion results will be invaluable in the analysis of flame spread over corrugated fiberboard to characterize its flammability.

Publications: None yet.
Dora Wu

Status: Junior, Mechanical Engineering/Music Performance
Research Topic: Six Axis Gantry for the RoboMoth System

Advisor(s): Roger D. Quinn, Ph.D.

Biography: I came to Case Western from Houston, Texas. I am currently a Senior, majoring in Mechanical Engineering and Music Performance. I recently got accepted into the BS/MS Program at CWRU and will be working on getting my Master’s Degree in Mechanical Engineering.

Last year, I worked for Fives North American Combustion designing a line of air cooled fuel injectors. The year before that, I worked in the Biologically Inspired Robotics Laboratory on the Urban Search and Rescue Robot (USAR), the Caterpillar Whegs (Wheel Legs) robot, and the RoboMoth. This experience led me to adopt the RoboMoth as the subject of my Master’s thesis.

Outside of class, I have worked on the car as a member of the Formula SAE team. I played violin in a quartet and currently play in the Case/University Circle Symphony Orchestra. In my free time, I enjoy reading a good book.

Abstract: The ultimate goal of the RoboMoth is to have a robot that can track the source of odors. This technology would have many applications, such as finding hidden bombs, pollution sources, or illegal substances. Another use could be aiding in search and rescue missions that would be unsafe for humans or animals to attempt.

The RoboMoth system is going to upgrade to a gantry that is able to achieve six degrees of freedom in order to better mimic the motions of real. The current gantry has three degrees of freedom: left/right, up/down, and front/back. The purpose of this project is to integrate roll, pitch, and yaw into the system. Future work would include integrating the added degrees of freedom into the current tracking algorithms.

Publications:
Regulation of Genes by ETS2 Transcription Factors

Senior, Biology

Dr. Alicia E. Schaffner

I am a Senior Molecular and Cellular Biology major studying at Cedarville University. My hometown is Harleysville, Pennsylvania, and I am the oldest of three boys. In high school I developed a passion for science, specifically biology. During college, I have realized that medicine is the best avenue to fulfill my desire to study science as well as my desire to serve others. Partially inspired by medical trips to Mexico and Swaziland, I hope to pursue a medical doctor degree and practice in a medically under served area.

Families of proteins that bind to DNA and regulate transcription of genes are known as transcription factors. The transcription factor ETS family has been shown to regulate genes involved in cell division, extracellular matrix remodeling and cell migration. Thus, malfunctions in the ETS pathway have been implicated in a number of human cancers. Particularly, mutations in the upstream GTPase Ras can affect ETS transcriptional regulation. In normally functioning cells, extracellular growth factors bind to tyrosine kinase receptors, activating Ras. Ras activates Raf, and in the ensuing kinase cascade, Raf phosphorylates MEK, which phosphorylates Erk. Erk then travels to the nucleus where it phosphorylates Ets2, activating the transcription factor to upregulate transcription of genes. However, in many cancerous cells with Ras mutations, Ras is constitutively active, thus causing a constitutive transcription of Ets2-regulated genes.

In our experiments, we will explore if Ets2 is constitutively bound to DNA in the absence of activation by the Ras pathway, or if Ets2 only binds to DNA when it is activated through phosphorylation by Erk. In order to do this, we will be using chromatin immunoprecipitation (ChIP) under different conditions to test if Ets2 is constitutively bound to its DNA promoter even in the absence of phosphorylation. A Ras-mutated cell line will serve as our positive control, where phosphorylated Ets2 is bound to DNA at all times. If we are able to successfully elucidate the state of Ets2 binding to DNA, we would like to further explore the ways that Ets2 is actually causing changes in the chromatin state of DNA in order to regulate genes. Hopefully, through this process we can better understand the transcription of certain genes that have been implicated in human cancers.

None yet.
Erkai L. Watson

Status: Senior, Mechanical Engineering
Research Topic: Development of Over-Expanded Cycle Internal Combustion Engine
Advisor(s): Lawrence Zavodney, Ph.D.

Biography: Although I was born in the United States, I grew up mostly overseas. While growing up in Nicaragua, the combination of an American father, a Chinese mother, and Nicaraguan friends allowed me to become fluent in three different languages. After attending a local school in elementary, I was home schooled which gave me great flexibility to travel often to Taiwan and the U.S. with my family. This flexible schedule also allowed me to pursue interests like carpentry and blacksmithing. The excitement of using a hammer and anvil or drill and saw to build my projects inspired and spurred me to pursue engineering.

Arriving at Cedarville University, my interest in the practical aspects of engineering led me to projects where I could apply my engineering knowledge. These opportunities, such as the Supermileage competition team, which strives to build very fuel-efficient vehicles, have given me practical experience in lab testing, measurement techniques, and manufacturing processes. Outside of engineering, my interests include playing the violin in the university orchestra, hiking, and scuba diving. Upon graduation I plan to pursue a Master's Degree in Mechanical Engineering.

Abstract: In a conventional internal combustion engine, the crankshaft limits the four strokes to four segments of equal phase angle and displacement. If the crankshaft were replaced with a driven cam and follower, great flexibility in engine design can be achieved. By defining the cam profile to allow for a variable stroke length, an over-expansion, based on the Atkinson cycle, can be achieved. In a standard SI engine, when the piston reaches BDC at the end of the power stroke there is still pressure left in the cylinder that is lost when the exhaust valve opens. If the piston could travel further, i.e. an over-expanded power stroke, this leftover pressure could be harnessed to do some more work on the piston. Continuing from research already begun at Cedarville, further work is focused on building a working prototype to demonstrate the feasibility of this engine cycle. The driven-cam configuration enables unique kinematic options that can be used to lower the brake specific fuel consumption of a spark-ignition internal combustion engine by harnessing the leftover pressure, allowing flexibility in stroke timing, and reducing the cylinder wall frictional losses. These modifications have the potential of improving the efficiency of the ICE.

Publications: None yet.
Malia B. Amling

Status: Junior, Electrical Engineering
Research Topic: Low-Cost Implementation of Vehicular Platooning using PIC Microcontroller and Diversified Sensors
Advisor(s): Dr. Vicky Fang

Biography: Growing up in Santa Barbara, California, my homeschooled education provided me with the flexibility to pursue the topics that interested me. I spent hours reading and researching whatever caught my interest. I also loved team sports, of which soccer and outrigger canoeing were favorites. Upon high school graduation, I opted to move far from home in order to attend Cedarville University. Because of my wide variety of interests, I explored various academic disciplines before I chose a major. Looking for a challenge, I decided to try some engineering classes. It didn’t take long for me to declare electrical engineering as my primary course of study. Over the past few years, I have been part of Cedarville University’s robotics team which competes in an event sponsored by ASEE, as well as the Supermileage team which competes in the Shell Eco-marathon. Through my numerous class projects, competition teams, and internships, I have become certain that I will enjoy my future career in the field of electrical engineering.

Abstract: Collision avoidance systems have been developed and implemented in diverse ways. A result of collision avoidance technology is the development of a capability known as platooning. Platooning is the idea that one vehicle tracks and follows the movements of another. A major consideration in the implementation of platooning is the cost. In this project, a low-cost, but efficient implementation of a platooning system is designed and implemented using PIC18 microcontroller and various sensor technologies. Results from previous studies show that multiple types of sensors are far superior to using a single sensor in both the reliability and the cost. Therefore, ultrasonic sensors are used to track the distance between the two vehicles. IR and RF sensors work independently in tracking the turns, and then compete with each other to reach more accurate turning decision. Low-cost PIC microcontrollers are selected as the major computing units. The experiments were performed on two microcontroller cars in a controlled laboratory environment. This low-cost implementation of vehicle platooning can be used to make the future of platooning vehicles on the highway more efficient and cost-effective. Also, the simplicity and ease of installation makes this system a good candidate for use in factories or other applications where it is beneficial for one machine to follow another.

Publications: None yet.
Biography: I enrolled at Cedarville University in 2010 as a Biology major with a Pre-med focus. My initial goal was to excel beyond my fellow students in what, at the time, I considered to be the most challenging career path available. However, through the honors program, debate team, and numerous personal influences; my passions have turned increasingly toward issues of social justice and missions. Throughout the course of my studies, I also discovered that I have a strong affinity for the biochemical or, as we fondly describe it at Cedarville, dark side of biology. As a Junior, I am now working on a B.S. in Molecular and Cellular Biology with the intent of pursuing either an MD or an MD/PhD following my undergraduate studies. After graduate school, I intend to work in an underserved region, either domestically or internationally.

Abstract: Previous studies have demonstrated that miR-328 regulates a number of proteins via degradation of the 3’-UTR and as a RISC-independent decoy (Atkinson, 2010). Analyses of mRNA sequences for DNA damage response proteins using targetscan indicate that miR-328 may also regulate H2AX (Wouters, Gent, Hoeijmakers, & Pothof, 2011), a histone variant essential in repairing DNA double stranded breaks (Dickey, Redon, Nakamura, Baird, Sedelnikova, & Bonner, 2009). This project will test whether or not miR-328 post-transcriptionally regulates H2AX by transfecting HeLa cells with synthetic miR-328 mimic and measuring mRNA knockdown by quantitative real time PCR. If miR-328 tests negative as a posttranscriptional regulator of H2AX, then the focus of this study will shift to testing for direct action of miR-328 on the H2AX protein itself.

Publications: None yet.
Chellvie L. Brooks

Status: Senior, Manufacturing Engineering

Research Topic: High Altitude Ballooning Competition for Intercollegiate Balloon Competition

Advisor(s): Dr. Augustus Morris, Jr.

Biography: I was born and raised in Dayton, Ohio, by my beautiful mother and grandmother, Litisia and Charlene Roberts. I am the middle child of three young ladies. I am the first to attend a school of higher education. I attended Belmont High School freshman year and finished my sophomore through senior year at John H. Patterson Career Center; where I studied different fields of engineering. I am currently attending Central State University as an undergraduate, studying Manufacturing Engineering with a minor in Business Administration. Here at Central State, I am a Vice President for the National Society for Black Engineers also known as NSBE, whose duties are to step in when the President is not available or cannot serve. As Vice President I go about doing the work that needs to be done and exhibit strong leadership in the absence of the President. I make it my duty to be supportive of the President, understanding my role, supporting the mission/vision/values of the organization and keep the President informed of all actions taken. I am also a member of the Society of Manufacturing Engineering, a member of Toast Masters, and Miss College of Science and Engineering. Since I've been in undergrad I have maintained the Dean's List, which requires a 3.0 grade point average or higher. Outside of campus life, I am a member of a non-profit organization known as God’s Greatest Gifts or 3Gs. After my matriculation here at Central State, I plan to further my education by attending graduate school with a concentration in Electrical Engineering. After receiving my Master’s Degree, I hope to begin the working portion of my career.

Abstract: Central State University has a student balloon satellite program to provide opportunities leading students to choose careers in the aerospace fields. A major goal of the program is to routinely launch scientific payloads to altitudes reaching 100,000 ft using helium-filled weather balloons. After several successful launches from Central State, this effort will focus on payload design and data collection within the spirit of friendly competition. Central State plans to enter into the Intercollegiate High Altitude Balloon Competition, hosted by Taylor University at Upland, Indiana. This contest requires each payload to be capable of collecting temperature, pressure, humidity, or pictures within set specifications. During the flight, each payload must collect and store its data only when signaled remotely by the command module. After the flight, the payload will be mailed back to Central State for data retrieval and analysis. The winner of the competition depends on total points scored on Preliminary and Critical Design Reviews, maintaining payload design specifications, and final data review. The launch date for the competition is April 6, 2013. This presentation will detail the design and testing of the payload entered for competition.

Publications: None yet.
Beatrice M. Burse-Wooten

**Status:** Senior, Manufacturing Engineering  
**Research Topic:** The Effect of Multi-Walled Carbon Nanotubes on the Mechanical Strength of Fiber Reinforced Polymeric Resins  
**Advisor(s):** Dr. Abayomi Ajayi-Majebi, P. E.

**Biography:** I am an undergraduate student majoring in Manufacturing Engineering with minors in Business Management and Mathematics. I am originally from Cincinnati, Ohio, where I graduated from Walnut Hills High School. I am now a Senior attending Central State University in Wilberforce, Ohio. I am currently involved in several organizations on campus including the National Society for Black Engineers (NSBE) Finance Chair, Society for Manufacturing Engineers (SME), Student Support Services and I am a STEM tutor. In addition to the OSGC Scholarship, I am a Benjamin Banneker Scholar, a Boeing Scholar, and a Do-STEM Scholar. My interests include car repairs, journaling, and computerized drawings. Upon graduation I plan to go to graduate school for either Electrical Engineering or Engineering Management.

**Abstract:** This research is aimed at evaluating the mechanical strength improvement effects of multi-walled carbon nanotubes the preparation of IZOD impact test specimens cured in a forty-two-(42)-sample mold. These molds will be made in the Manufacturing Engineering Department by mixing polymeric resins with carbon nanofibers in a fiber reinforcement matrix made of either kevlar fiber reinforcement or glass fiber reinforcement. The specimens will be cured in a temperature controlled high precision oven and then tested for mechanical strength using an INSTRON tensile testing machine and an IZOD impact testing machine. An experimental design will be performed to ensure a scientifically valid experimental test program. A computer program will be written to batch the various components to be mixed prior to the specimen curing process. The strength of the control group (with no nanomaterials interspersed) IZOD test specimens will be compared to the nanomaterial interspersed group. The strength improvements obtained or the lack thereof by nanomaterial infusion will be evaluated using statistical analysis techniques.

**Publications:** None yet.

**Congressional District:** 10th  
**Congressional Representative:** Michael R. Turner
Dominique N. Roberts

Status: Senior, Manufacturing Engineering

Research Topic: Investigation and Design of a Powered Parafoil and its Applications in Remote Sensing

Advisor(s): Dr. Augustus Morris, Jr.

Biography: It wasn’t until my junior year in high school that I realized or had an idea of what I wanted to pursue as my future career. Being a well-rounded student, it was difficult for me to identify what I really had a passion for. While in high school I discovered my interest for science. My most accomplished project didn’t occur until junior year, but it was well worth the wait. Amongst many other awards and scholarships, my accomplishment earned me a trip to Atlanta, Georgia, for the international science fair. The best thing that has happened as a result of my newfound aspiration was the acceptance to Central State University and the scholarships that were presented to me. Entering in the Manufacturing Engineering field was the opportunity for me to enhance my skills and use them to better my community in the future. The opportunities available through this program are endless. I can now say that I have found my passion and I have the chance to make it my career. I have done so by accepting multiple internships with well recognized companies in my industry and applying my newly acquired skills.

Abstract: A powered parafoil is a type of aircraft which typically falls in the category of ultra light aircraft. Training, but not a pilot’s license is required to fly a powered parafoil. This type of aircraft is suited for flying at low altitudes and speeds. Even though the parafoil is a flexible wing structure, it is proven to be a stable platform for flying and maneuvering at low speeds. This may be a perfect platform for remote sensing the health of vegetation on small to medium sized farms.

This project will look at the design of a small, remotely controlled, powered parafoil capable of carrying a lightweight camera system able to collect images in the visible light and near infrared range for later processing. Such a system could prove to be ideal for many of the local farmers in the Central State vicinity. This investigation will consider the challenges of carrying the appropriate sensors, keeping the total mass to a minimum, and controlling its position through remote control. Initial results from this investigation will form the basis for future work in the area of precision agriculture.

Publications: None yet.
Donielle E. Brooks

Status: Junior, Water Resource Management/Environmental Engineering

Research Topic: Preliminary Exploration of Environmental Conditions in Mars for the Survival of Human Habitation

Advisor(s): Krishna Kumar V. Nedunuri, Ph.D.

Biography: Donielle Brooks is a senior at Central State with a double major. The first major is Water Resource Management, which she will be graduating with in May of 2013. The second major is Environmental Engineering, which will be completed in 2014.

While attending Central State University, Donielle worked at the Greater Metropolitan Sewer District in Cincinnati, Ohio. Donielle also did an internship for the Department of Energy and National Nuclear Security Administration in Albuquerque, New Mexico.

When not doing school-related activities, Donielle enjoys singing in her church choir. She also likes to spend time with family and friends and engage in outdoor activities. After the completion of both majors, Donielle plans to attend graduate school in the Fall of 2014 to further her education in space and environmental related aspects.

Abstract: The purpose of the experiment is to investigate whether Mars can be terraformed to produce vegetation using thermophilic bacteria, *Thermus thermophilius*. It is a gram negative bacterium known to degrade organic waste. This strain of bacteria when used in composting yields nutrients needed for a healthier plant that is safer for human consumption. It is necessary to use thermophilic bacteria so one can approximately mimic the high temperature conditions in Mars. In a 48 ¼” x 12 ¾” x 21” and a 55 gallon tank that will be isolated from earthly factors, attempts to replicate conditions (atmospheric conditions) by designing a landscape close to a typical Martian crater will be made; the experiment will investigate whether bacteria allow vegetation to grow in time using photosynthesis that sequesters CO₂ available in the Martian atmosphere and releasing more oxygen.

Publications: None yet.
Status: Junior, Chemistry

Research Topic: Fire Retardant Composite Materials

Advisor(s): Dr. Ibrahim Katampe and Dr. Suzanne Seleem

Biography: He is from Milwaukee, Wisconsin. He went to Rufus King International Baccalaureate High School. Likes to play sports and work out during spare time. He chose to major in Chemistry hoping to pursue a career in material science, polymer science, environmental science or in chemical engineering. He is still undecided on what to be in the future, but as long as it is helping making or enhancing a material that can benefit the world.

Abstract: Thermoplastic materials have wide applications in material science. However, the high flammability of the materials limits their applications as a requirement for fire safety. For example, polystyrene, an inexpensive and durable polymer that is used in a lot of commercial, household and industrial appliances have a weak melting properties and is very flammable. Innovation is necessary to get these flame retardant properties in the resulting composite materials.

My goal is to find eco-friendly chemistries for the synthesis of various polymer systems that will result in composite materials with flame retardant properties.

Publications: None yet.
Ian A. Conant

Status: Junior, Mechanical Engineering
Research Topic: Optimization of Additive Manufacturing Processes

Advisor(s): Dr. William Atherton

Biography: Born and raised in Lakewood, Ohio, I attended a large high school and took advantage of a full offering of AP Courses and a Pre-Engineering Program. But my interest in science didn’t start there; ever since a young age I have been fascinated with technology, how things work, and new scientific developments. I have always felt that people can live fuller lives through the proper use of technology, and now I am starting to reach the point in my life where instead of just observing technology being developed, I can have an impact on its development. When you impact technology, you impact people, and I intend to have a positive impact on both.

Abstract: Additive manufacturing has been embraced as a successful means for prototyping parts quickly and cheaply. Automated additive manufacturing machines, often referred to as 3D printers or rapid prototypers, now have the ability to print objects composed of multiple materials including metal, polymer, and ceramic, all with high precision and good surface finish at an ever decreasing price point. Although the use of 3D printers is established as a valuable aid to design engineering and an acceptable method for small production runs of applicable parts, the use of 3D printers for large scale part production is still unfeasible, mainly due to the fact that the rate of part production is far less than that of traditional volume manufacturing techniques. While 3D printing may never replace current volume production methods for simple parts, in the near future it may prove to be a better option for volume production of highly complex parts, or parts that simply cannot be produced by traditional means. Therefore, it is prudent that the shortcomings of 3D printers for volume production be addressed and practical solutions found.

Publications: None yet.

Congressional District: 9th
Congressional Representative: Marcy Kaptur
Teisha L. N. Mullins

Status: Junior, Chemical Engineering

Research Topic: Obtaining a Pure Protein Using an ELP-Tagged TEV Protease

Advisor(s): James T. Cole, Doctoral Candidate, and Nolan B. Holland, Ph.D.

Biography: Teisha has a lifelong love of education and is currently in the Honors Program at Cleveland State University. She began working with elastin-like polypeptides in Dr. Holland’s lab in May of 2011 until December, 2012. Teisha currently holds a full-time co-op position at PolymerPlus in Valley View, Ohio. She is also the current president of CSU’s American Institute of Chemical Engineers (AIChE) student chapter and, under her leadership and the assistance of the Chemical Engineering Department, the organization was able to travel to the National Student AIChE Conference in October, 2012, for the first time in over a decade. She is also involved in the Society for Women Engineers at CSU and is an active member of her on-campus community. Teisha plans to participate in the 4+1 Program at her school in the upcoming year and continue her chemical engineering education at the Master’s level. After graduation, she hopes to obtain a job in industry and then eventually return to academia to complete a Doctoral degree in Biomedical Engineering with a focus on neural prosthetics. Her lifelong goal is to one day work in the Biomedical Engineering Department at the world renowned Cleveland Clinic Lerner Research Institute.

Abstract: Elastin-like polypeptides (ELPs) reversibly aggregate and phase separate above and solubilize below a specific transition temperature (Tt). ELPs are composed of repeats of the structural sequence of the elastin protein, Gly-Xaa-Gly-Val-Pro (GXGVP). Xaa is a “guest residue” in the sequence and can be replaced by any amino acid, with the exception of proline, P, in order to alter the transition temperature. ELPs can then be attached to recombinant target proteins as a tag to facilitate protein purification in a process called inverse transition cycling (ITC). Here Gly-Leu-Gly-Val-Pro (GLGVP) is used for tagging and purifying a gadolinium binding protein domain, CA1.CD2. After the protein purification, it is ideal to remove the ELP tag from the target protein. To accomplish this, a tobacco etch virus (TEV) protease cut site was inserted between the target protein and the ELP tag. The TEV protease is also tagged and expressed with an ELP so that once the TEV protease cleaves the ELP tag from the target protein, a single round of thermal cycling can remove both the free ELP tag and the ELP-tagged TEV protease. The pure target protein is then left in the solution.

Publications: None yet.

Congressional District: 13th
Congressional Representative: Timothy J. Ryan
Biography: I grew up in Cincinnati, Ohio. In high school, I developed a specific passion for the biological and chemical processes that transpire from the use of modern medicine. The vast plethora of fields related to those processes fascinated me. I longed for a career that submerged itself into the complex array of anatomical physiology. Therefore, the pursuit of pharmacy seemed only natural as it would be an opportune field to capitalize on my skills as well as a chance to follow my interest. I am interested in the creation and research of medicinal drugs, and its effects on biological organisms. As a result of being a part of the Ronald E. McNair Post-baccalaureate Achievement Program and undergraduate research, since 2010, I have been examining pharmaceutics, receptors, as well as some oncological work. I plan to pursue a Doctoral Degree in Pharmaceutical Science and ultimately go into the creation of new pharmaceutical drugs.

Abstract: Tissue damage prompts a complex network of cellular biochemical events known as the wound healing process. Wound healing is often slow, subject to infection and significantly impaired with comorbidities such as diabetes. Hence therapeutic strategies to manage wounds are of great clinical interest. It has been determined that one critical factor in producing a receptive wound environment is correction of wound hypoxia. Recent studies have identified that oxygen is not only required to disinfect wounds and fuel healing, but that oxygen-dependent redox-sensitive signaling process as an integral part of the healing cascade. Therefore, agents that induce low levels of oxidants (H₂O₂ and NO) can modulate signaling pathways (i.e. VEGF), and impact all phases of wound healing. Apatone and a phenolic compound have previously shown to influence keratinocyte cell division and wound closure in an in vitro scratch assay. The research objective was to determine the role of H₂O₂ as it relates to wound healing for both Apatone and the phenolic compound. The cleavage of the fluorescent dye DCF-DA was used to detect H₂O₂ production in a 96 well plate assay format. The resulting fluorescent product was then measured (ex/em) using a fluorescent plate reader. Apatone was measured at three different concentration of vitamin C to vitamin K, in a ratio of 100:1. It was performed at 5000/50 μM, 2500/25 μM, 1250/12.5 μM, and 625/6.25 μM. Intracellularly Apatone fluoresced 29.33, 59.30, 54.83, and 50.45 respectively for the decreasing concentrations. Extracellularly Apatone fluoresced 52.07, 58.57, 73.60, and 80.10 respectively for the decreasing concentrations. The results from the application of Apatone showed the increased production of H₂O₂ both intracellularly and extracellularly which has been shown to be imperative for wound healing. The experimentation is ongoing and further investigation is being performed.

Publications: None yet.
Matthew C. Boothe

Status: Senior, Petroleum Engineering
Research Topic: A Climatic and Depositional Analysis of the Benwood Limestone

Advisor(s): Professor Benjamin W. Ebenhack and Ms. Wendy Bartlett

Biography: Currently, I am in the second semester of my Senior year at Marietta College. I am pursuing both a B.S. in Petroleum Engineering and a B.S. in Geology. Before embarking on my academically rigorous collegiate experience, I enjoyed playing baseball and football at Dublin Jerome High School. There, I discovered my love for math, science, engineering and geology alongside my continuous love for athletics.

My choice to attend Marietta was initially made based on my pursuit of becoming a college baseball player for a top notch Division III program. But when my arm could not hold up and I was cut from the team, it turned out to be a great blessing in disguise. With my free time and high aspirations for success, I have been able to become extremely active in campus extracurriculars and academic honors such as this. I am Vice Chair for the Society of Petroleum Engineers and Secretary for the American Association of Drilling Engineers. These leadership positions along with three summer internships in the oil and gas industry have helped give me the opportunity to really grow as an individual and help shape who I am today. After graduation I look forward to beginning my employment with Southwestern Energy in Houston, Texas. There my bride to be, Kaitlyn Ciminillo, will join me on August 17, 2013, as I begin my life after college!

Abstract: The purpose of this study is to investigate the relationship between stratigraphic cycles, depositional environment, and climate change within the Benwood Limestone. Through topical research, field geological analysis, lab testing, climatic, and depositional analysis, the aim is to match the existing historical geology work that has been done in the region. The different types of lacustrine limestones along with geologic features such as the “red-beds” will enhance my understanding of the cyclicity of alternating red shales and lacustrine limestones.

This field research examines the cyclicity of alternating red shales and lacustrine limestones within the Benwood Limestone. Located at mile marker 15 on Interstate route 77 northbound, this formation is a member of the Pennsylvanian Monongahela Group (Camp, 2006). The Ohio region was located around 5° and 15° south of the paleoequator during the Pennsylvanian (Cecil and others, 1985; Donaldson and others, 1985).

This Group is 450 meters thick from the base of the Pottsville Group to the base of the Dunkard Group in Athens, Ohio, which represents a thickness that is an order of magnitude less than similar foreland deposits (Gierlowski and others, 1998). Although this section is thinner than others, it still contains 45 different named cyclothems on the basis of descriptions within Ohio and adjacent states (Gierlowski and others, 1998). This supports the idea that the lakes and sea level regression may have left these sediments exposed to the atmosphere and subjected them to oxidation because of the region’s sensitivity to changes in relative sea level. Support for the interpretation of the depositional environment and climatic setting of the time was brought to light in the following discussion on the local setting of the Monongahela Group.

Continued on the Next Page...
Abstract: (Continued)
Finally, studies on these paleosols and nonmarine carbonates suggest the presence of a seasonal climate change that has yet to be determined whether the seasons are systematic or variable. The climate of deposition can be interpreted by the paleosols and lacustrine limestones that exist within this particular outcrop (Gierłowski and others, 1998). These sediments are most commonly deposited within different sequence stratigraphic sections, which make this outcrop very unique. The lacustrine limestones are usually deposited in a high stand systems tract and followed by a paleosol capping the high stand deposits (Gierłowski and others, 1998). So, for this project it will be important to be able to isolate one of the seven sedimentary origins of the non-marine carbonate that lies in my outcrop.

Publications: None yet.
My name is Benjamin Daniell. I am a Junior at Marietta College studying Petroleum Engineering. Since I was little, I have had a knack for problem solving and it is no wonder that I ended up as an engineer. In my down time I listen to music, play golf, paintball, and play x-box. And it is important for me to say that my father is my inspiration for working so hard.

My idea is to inject biological markers into oil reservoirs that bond only to the heaviest of hydrocarbons (C100+). These markers will be designed to indicate to the bacteria, which are naturally found in reservoirs, that the item is a food source. The bacteria will proceed to break the heavy hydrocarbons down into more useful fuel sources.

None yet.
Biography: My name is Jeffrey Lucas, but most people call me Howie. I was born in Huntington, West Virginia, but I lived in Ironton, Ohio, all of my life. As I entered high school, I enrolled in an engineering program called Project Lead the Way. Through this program I was able to find petroleum engineering. It intrigued me because I wanted to learn more about how a company retrieves oil and gas out of the ground. As my high school years dwindled away, I started looking for colleges to attend. I came across a small school known as Marietta College. It reminded me of home and it had one of the best petroleum engineering programs in the nation. I took a tour during my senior year, and I knew from that moment on I wanted to attend Marietta College.

During my freshman year I tried out for Marietta College’s prestigious baseball program. Fortunately, I made the team and the season went well. We earned the Division III National Championship title. Along with an excellent baseball season, my grades were exceptional. Unfortunately, during the summer I injured my arm and had to give up my baseball career. My sophomore year had the empty void of baseball, but I filled it with my interest in petroleum engineering and the drive to get an internship with an oil and gas company. By the end of the semester, I had landed an internship with EnerVest Operating in Dover, Ohio. I increased my knowledge in the field working for EnerVest. This upcoming summer I will travel to Bakersfield, California, for a drilling engineering internship with Chevron.

Once I graduate, I hope to work for a prestigious oil and gas company as a drilling engineer. I will apply my strong work ethic and self-motivation to achieve my career goals.

Abstract: As oil and gas companies increase operations in the Marcellus and Utica shale plays, more citizens become concerned with aquifer contamination. Throughout the years, some incidents occurred in Pennsylvania that left local citizens with tainted water. Since then, people began widespread protesting against “fracking” and oil and gas companies. This project presents a thorough description of a typical shale operation and reveals any potential threats to water aquifers. While this research describes the entire operation, it puts an emphasis on hydraulic fracturing. It also looks at other possible means of aquifer contamination including gasoline stations and acid mine drainage. Finally, a conclusion is made about possible contamination from operations in northeastern shale plays. This conclusion consists of whether there is a genuine contamination risk and any precautions oil and gas companies should take. The sources used in this project include non-biased and reliable government agencies that provide numerous useful statistics. Some proposed modifications to shale play operations originate from my own knowledge gained from petroleum classes such as Formation Evaluation. The main purpose for this research project is to educate people about the processes involved in the field and to reveal any flaws that shale play operations may contain.

Publications: None yet.
Biography: I am a Junior status Petroleum Engineering student at Marietta College with intentions of also earning a minor in Geology. I graduated from Strongsville High School as Phi Beta Kappa, where I realized that engineering was a field in which I was really interested. I am the president of the Geology Club, a member of the Society of Petroleum Engineers, the American Association of Petroleum Geologists, Math Club, and a member of the Alpha Sigma Phi fraternity.

Over the 2012 Summer I gained experience in production engineering and horizontal shale gas wells with a small petroleum company that has operations in Ohio and West Virginia. I also have an internship with another independent petroleum company set up to work on coal bed methane production for the summer of 2013. My interest in shale started freshman year upon arriving at the college, where all of the talk was about the Marcellus and Utica Shale. After taking a petrophysics course and working on a Marcellus well over the summer, when the opportunity to study the shale arose, I jumped on it.

Abstract: Black shales, most notably shales that are Devonian in age (416-360 million years ago), have high concentrations of organic material. While it has been known that black shales make good oil source rocks, it is only relatively recently that advancements in horizontal drilling and hydraulic fracturing have shown that the shales can make good gas reservoirs.

The goal of this project is to holistically study these shales and the problems associated with them. One of the main tenants of this project is the examination of the petrophysical characteristics that make the shale a good reservoir, such as the pore morphology and permeability, or the amount of void space in the rock and how well they transmit fluids. An additional goal of the project is to examine the geologic characteristics of the shale, such as microfossils, minerals, clays and fractures and examine how they can have an impact on the petrophysics.

By understanding more about the composition, structure, and behavior of the shale, it should be possible to begin addressing the problems in studying it and help make exploring, drilling and producing the formations more economical.

Publications: None yet.
Harrison W. Bourne

**Status:** Senior, Electrical Engineering

**Research Topic:** Multi-Method GNSS Ionosphere Mapping GUI

**Advisor(s):** Dr. Yu Morton

**Biography:** Harrison Bourne is a Senior Electrical Engineering student at Miami University. He is a research assistant in the Electrical and Computer Engineering department studying methods of mitigating Ionosphere induced error in GPS receivers and Ionosphere mapping. He has also participated in research in the Physics department focused on laser spectroscopy and atom cooling. Mr. Bourne is a member of Tau Beta Pi engineering honor society, the Miami branch of IEEE and the Institute of Navigation.

**Abstract:** There are a number of methods currently available for creating maps of the ionosphere. One method utilizes a global network of dual frequency GPS receivers to calculate the TEC values across the sky. The International GPS Service for Geodynamics provides this data as a global map with TEC measurements every 2.5° of latitude and 5° of longitude. There are also mathematical models which attempt to estimate the TEC using a number of coefficients. The most widely used of these is the Ionosphere Correction Algorithm (ICA) which uses eight coefficients broadcast as part of the GPS navigation message. The ICA can calculate up to 50% of the true TEC value. There are also more complex models, such as the International Reference Ionosphere (IRI) and the Bent model, which utilize hundreds of coefficients to obtain the monthly average TEC. These models approximate up to 75% of the true TEC. The focus of this research project is a new method of TEC mapping which allows real-time ionosphere mapping using a single frequency GPS receiver. This method operates by introducing the electron content (TEC) of the ionosphere as an additional variable in the range equations used to calculate a receiver's position. In the standard range equations the x, y, z location of the receiver and the receiver's clock error are being solved for. To do this the distance between the receiver and four satellites must be determined, but with these new variables to solve seven satellites are needed. The need for seven satellites is not a drawback because eight to fourteen satellites are typically visible to a receiver at any given time anywhere in the world. However this method assumes the ionosphere delay across the entire area of the sky visible to the receiver only varies linearly. While this assumption is not strictly accurate it is a reasonable approximation. The advantage of this method is it does not have the inherent inaccuracies of models and avoids the interpolation required when creating ionosphere maps using dual frequency measurements. Also this method is not affected by hardware bias which plagues dual frequency measurements.

Even with these multiple methods of calculating TEC no one has created a way to easily compare the results obtained. The second goal of this research project is to create a program which collects the TEC data from all of these various sources, including the one I am currently developing, and allows the methods to be easily compared. This system would allow statistical analysis of the TEC data making it possible to create improved TEC mapping methods and thus TEC maps.

**Publications:** None yet.
Biography: I was born and raised in Lakewood, Ohio. For my entire life I have been interested in mechanical systems and learning how things worked, so getting into engineering was an easy decision. I am currently a senior at Miami University where I am also involved with ASME and Tau Beta Pi. For the past two years I have conducted H-MRE related research with Dr. Koo. I have also interned over the summer at ArcelorMittal Steel outside of Chicago. After graduation I plan to work for a few years before possibly applying to graduate school.

Abstract: The goal of the project is to examine the feasibility of using Hard Magnetorheological Elastomers as actuators in a tactile feedback device. H-MREs consist of hard magnetic particles suspended in a rubber base material. When exposed to an external magnetic field, the H-MRE reacts physically. Depending on how the material is created, this physical response could include for instance altering the material stiffness or creating torque. For this project I am developing H-MRE materials which generate torque to act as bending actuators which operate a pin array tactile feedback display. Beams of H-MRE material will be individually controlled with small electromagnets. When the electromagnets are activated the H-MRE beams will bend which will cause pins to raise and lower on the display. By coordinating multiple actuators shapes or characters will be formed which users can feel with their fingertips. Last year related concepts were explored using H-MREs and I have good background knowledge of the field. Preliminary work has been conducted on the H-MRE material composition as well as the electromagnet design.

Publications: None yet.
Drew N. Hathaway

Status:  Junior, Mechanical/Manufacturing Engineering
Research Topic:  Dynamics of Swarm Robotics

Advisor(s):  Dr. Amit Shukla

Biography:  My hometown is Darien, Connecticut. My current career goals are to work at an internship this summer and use the knowledge from that experience to better evaluate the field of engineering that I want to go into. This experience will also help me to decide if I want to go to graduate school because I will have the opportunity to speak with others currently in the engineering profession. Engineering was something I became interested in during high school when I worked on a class project, where a small group of students worked with a professor to create a small fuel cell and battery powered car from scratch. Aside from my academic work at Miami, I am a member of the Miami Waterski Team, where we compete in tournaments throughout the Midwest and occasionally the country during the fall.

Abstract:  The concept of swarm robotics is a field of study that employs large groups of relatively simple and inexpensive robots to efficiently complete complex tasks. The actions of these robots are dictated by a set of rules implemented into each robot, in order to achieve a common task while avoiding collision and maintaining a desired formation. This type of swarm behavior is commonly found in nature. For example, fish will swim in a school, ants will converge to a food source, birds fly together in a formation, and many mammals travel in herds. They use communication based on recognition of action or a means other than spoken communication. Swarm robotics is the application of a set of rules to each robot in a swarm with the goal of completing a task or formation. The robots could be set up to explore an area or find a resource and collect it as a group. Rules are implemented to ensure mutual communication among robots in a designated range. The robots can be programmed to work in proximity while maintaining a safe distance. Depending on the task, the robots' underlying actions work in tandem with a set of rules that helps complete the task. It is of major importance to gain a solid understanding of the programming techniques in a small scale robot swarm before swarm robotics can be used in a large scale model. The goal of this research is to create programming laws for a robotic swarm that will complete tasks such as target location and target tracking while ensuring robust mutual communication among robots in the swarm.

The swarm models are designed and created with two objectives in mind. The first objective is a swarm that simply locates a target. The second objective is currently planned to be a swarm that will locate a target, return to a home base, and then repeat those actions. Each of these programs will implement a pheromone aspect in order for the agents in the swarm to locate a target and communicate with each other once this target is found. These programs use the basic rules of swarm robotics to achieve these goals. The programs will be used to study the efficiency of swarms with respect to the number of agents and the strength of the respective pheromone trails, one from the agents and one from the target.

Publications:  None yet.
James T. Morton

Status: Junior, Computer Science/Electrical Engineering
Research Topic: Applying Hidden Markov Models to Remove Artifacts from RNA Data
Advisor(s): Dr. Chun Liang (Botany) and Dr. John Karro (Computer Science)

Biography: Jamie Morton grew up in Oxford, Ohio, and attended primary and secondary school in the Talawanda School District. He worked at Wright-Patterson Air Force Base in the Summer of 2009 and 2010 where he worked on cognitive radio applications. In Fall 2010, he attended Miami University where he started bioinformatics research with Dr. John Karro and Dr. Chun Liang, and began to study the Alternative Polyadenylation mechanism. For his research project, he began developing two software tools SCOPE++ and SCRAP. In the Spring of 2012, he studied abroad in Hong Kong at Hong Institute of Science and Technology (HKUST). Over the Summer of 2012, he worked at Cold Spring Harbor Laboratories where he studied Allele Specific Expression in personal human genomes. He is currently working on refining SCOPE++ and SCRAP to continue his studies on Alternative Polyadenylation.

Abstract: Despite major breakthroughs in sequencing technology, DNA sequencing still remains prone to error. One significant source of error is the inadvertent retention of adapter and primer sequence fragments used in the sequencing processes which must be removed before downstream data analysis. Currently programs such as Seqclean and SSAHA2 (Ning et al. 2001; Chen et al. 2007) are used to clean these artifacts from raw sequence reads. These tools, however, make an unwarranted assumption of uniform error rates across the length of an entire read – a potential problem given that most sequencing technologies that are more prone to introduce errors in certain regions or under certain circumstances. Evidence shows that machine induced errors occur more frequently at the ends of the sequence reads, inhibiting the ability of these programs to clean raw sequence reads accurately. We propose using Profile Hidden Markov Models (Eddy 1998) to effectively find and remove the spurious sequence fragments from the cDNA reads. Instead of assuming a uniform distribution of error across the sequence reads, we build Hidden Markov Models based on an analysis of the fragment error probabilities for each base position and use the model to search for more spurious fragments. To this end, we are in the process of developing SCRAP (Sequencing Cleaning and Removal of Adapters using Profile hidden markov models), a tool that builds and trains a Profile Hidden Markov Model, and then apply it to a large sequence set in order to identify adapter fragments. Although our previous studies have shown that Profile Hidden Markov Models are more accurate than most existing pair-wise alignment tools, SCRAP is around 100 times slower than these tools. Our goal is to develop heuristics to make SCRAP at least as fast as existing pair-wise alignment tools.

Publications: None yet.
Biography: I am currently a Senior in my last semester at Ohio Northern University studying Mechanical Engineering. I grew up in Beavercreek, Ohio, and attended Beavercreek High School. My interest in engineering started at a young age when I would take apart my less interesting toys and turn them into my own creations. I always had to create a bigger, better model than what the original concept was. This habit has not changed over the years. When I grew older, my parents and grandparents told me about engineering and how it would be perfect for me. So I started to gain an interest in aerospace because of my grandfather, who himself was an aeronautical engineer and professor. He introduced me to many things and I have been hooked ever since.

The past two summers I gained experience in engineering when I obtained an internship at Wright-Patterson Air Force Base in the Micro Air Vehicles Department. I learned many important lessons about the workplace and it also led to an interest in micro air vehicle subjects. After finishing these internships and finishing classes in the field of thermal-fluid sciences, I knew that I wanted to pursue a career dealing with fluid flow and heat transfer. This fascination eventually led to the research projects that I have chosen over the last two years as an OSGC scholar.

Abstract: During the course of this school year I have been working on updating the data acquisition system on the Ohio Northern University closed circuit wind tunnel. The new data acquisition system will use National Instruments LabView to collect data from the wind tunnel and display it on a computer. This involves the creation of a LabView virtual instrument which will read in analog voltages sent from the tunnels measuring devices and convert them to the necessary units. The data will then be displayed on a front panel along with a graph of the measurements. The measurements displayed on the VI will include the lift force, drag force, x and y position of the pressure tube, and also wind speed. Once all of the updates are completed, I will test the validity of the measurements using other measurement devices. Also, sample experiments will be configured and conducted by fellow classmates to test the usability of the system.

Publications: None yet.
Biography: I am a Senior Ohio Space Grant Scholarship recipient for the 2012-2013 academic year. My hometown is Pandora, Ohio. I graduated from Pandora-Gilboa High School. I attend Ohio Northern University (ONU) where I am studying Mechanical Engineering. I have always been fascinated by the aerospace industry. As a child, I was always searching for the latest and greatest aircraft. This interest continued to grow as my parents let me fly with my uncle periodically. After enrolling at ONU my interest faded as job opportunities steered me in other directions. ONU does not have an aerospace degree program. Unknown to me, ONU has a strong knowledge base and a group of enthusiastic students running the campus’ AIAA organization. I joined this group and have since been elected Vice-Chairman despite spending the 2011-2012 academic year on a co-op assignment in Marysville with Honda R&D Americas Inc. My fifteen month co-op at Honda has delayed my graduation. Therefore, I currently have junior status at ONU. I was elected chair of the ONU section of AIAA for the 2012-2013 academic year. I am also serving as SAE Aero Design project leader.

Abstract: The objective of the SAE Aero project is to design, build and test a remote control aircraft. The aircraft’s objective is to lift as much payload as possible. The constraints are summarized below.

- The aircraft must take off in less than 200 feet from a stop. The aircraft must me be in flight in less than 3 minutes.
- The aircraft has 400 feet to come to a settled, rolling position. Upon landing all components of the craft must be attached.
- An unmodified 2 cycle O.S. 61FX engine with E-4010 muffler must be used.
- Successful flights must be a complete 360 degree circuit around the airfield.
- The total length, width, and height of the aircraft must not exceed 225 feet.
- The payload must be a solid mass upon takeoff. Teams are limited to one payload bay.

Teams are asked to predict the maximum payload their plane can carry. This is taken into consideration in the scoring of each flight round. Accurately predicting the lifting capacity of the aircraft is an important part of the exercise, as prediction bonus points often determine the difference in placement between competing teams. The regular class will be divided into 3 phases: Phase 1 consists of writing a technical report that will be judged by engineers at Lockheed Martin. In phase 2, our team will be traveling go to Fort Worth, Texas. The team will give a technical presentation discussing why our plane is the best design. The third phase is the flight competition. The plane will be tested alongside of 74 other competitors.

Publications: None yet.
Adam O. Black

Status:  Junior, Mechanical Engineering
Research Topic:  Remote Control Airplane Tail Design and Construction

Advisor(s):  Dr. Jed E. Marquart, P. E.

Biography:  I am a Junior Ohio Space Grant recipient. I was born and raised in Hilliard, Ohio, and graduated from Hilliard Davidson High School in 2010. Shortly after graduation, I moved with my family to Denver, Colorado. I am attending Ohio Northern University (ONU), where I am studying Mechanical Engineering with a minor in History. At ONU, I participate in a student run organization called AIAA. I am also involved with another group which designs and builds a remote control airplane which is taken to the SAE Aero East competition each spring. Last summer, I worked as a Systems Engineer intern for the company Raytheon and was fortunate enough to be hired back for this coming summer.

Abstract:  My project consists of researching tail designs for a heavy lift remote control airplane which my team from Ohio Northern University will take to the SAE Aero design competition. In order to do so, I will be analyzing lift and drag characteristics of symmetrical airfoils, researching existing tail designs, and studying the effect of wake on elevator and rudder efficiency. I will also be responsible for the tail’s design and construction. Parts for the tail will be designed using SolidWorks and produced using a CNC laser cutter.

Publications:  None yet.

Congressional District:  5th
Congressional Representative:  Robert E. Latta
Status: Junior, Mechanical Engineering

Research Topic: Payload Box Effectiveness for ONU SAE Aero Team

Advisors: Dr. Jed E. Marquart, P. E.

Biography: I have interned at Honda Research and Development as a part of the Crash Test Safety team, and I am currently on co-op with Marathon Petroleum Company as a pipeline engineer. This past summer I completed an independent study on the effects of adding an aftermarket air intake to the fuel economy of a car. The paper I wrote on this topic will be published in a scholarly journal. I am an active member of my school's branch of the American Institute of Aeronautics and Astronautics, as well as a member of the Joint Engineering Council. This year I was initiated into Tau Beta Pi. I completed my Spanish minor my sophomore year in hopes of broadening the horizons of my future career.

Abstract: The goal of my project is to determine a more effective way to insert and remove the payload box from the Ohio Northern University SAE Aero Competition plane. In the past, our planes have suffered from inefficient payload box design. This has resulted in lost points at competitions, changed center of gravity, and less overall payload potential. This year, I hope to improve design by making a simpler and more space-effective location in the fuselage for the payload, as well as develop a system which can be inserted and removed within the one minute time limit. Part of the time spent on this project will be spent in Solidworks developing a strategy for the box. The parts will then be laser cut onto wood sheets and can be tested to determine their strength and feasibility. There are several designs considered, and the one chosen by my teammates and I will be put to use on the 2013 SAE Aero Competition plane for ONU.

Publications: None yet.
Biography: Growing up with a background in automotive repair, mechanical engineering seemed to be the most appropriate profession to pursue. After high school, I transferred from the University of Rio Grande to Ohio University to finish my pursuit of a Bachelor's Degree in Mechanical Engineering. After one year at Ohio University, I was fortunate enough to be interviewed and hired for a co-op with GE Lighting. After four months with GE, I was hired directly to GKN Sinter Metals. After 5 months there, I was hired back to GE Lighting for a second rotation for three months. Between my third and fourth year at Ohio University, I was hired for my fourth co-op by Stanley Electric where I worked for almost two months in the summer. Having nearly 14 months of co-op experience, I developed a good foundation in the manufacturing industry from lighting to automotive.

In the middle of my third year at Ohio University, I decided to take training in flying small aircraft to earn a Private Pilot's Certificate. The training is the Ohio University Aviation Program and is an FAA accredited FAR 141 program and with aircraft type PA-128-161 Piper Warrior. Currently, at the midpoint of my fourth year at Ohio University, I have successfully completed my training and Check Ride for the Private Pilot's Certificate with the most basic privileges.

Abstract: This research project directly compares two Airplane Single Engine Land aircraft of the same make, model and airframe design, with the only differences being in the fuel system and the power plant. Specifically, an electric motor and its energy storage system will be compared to a standard engine system. Items of comparison include the safety, energy consumption, stability, maneuverability, payload capacity, endurance vs. performance tradeoffs, effects from weather, noise levels, FAA requirements, and operations in cases of emergency.

The report continues with discussing the modifications necessary to utilize electric engines as the power plant for a small aircraft, as well as the cost effectiveness of converting a combustion engine aircraft to an electric engine aircraft. This report concludes with a discussion of the availability and acceptance of electric engines in small class rating aircraft by the small class aviation and manufacturing industries.

Publications: None yet.
Andrew S. Dewald

**Status:** Junior, Chemistry/Physics

**Research Topic:** Studies of Energy Deposition by High-Energy Particles and Applications to Ultra-High-Energy Cosmic Ray Collisions

**Advisor(s):** Dr. Justin Frantz

**Biography:** A native of Athens, Ohio, I attended Athens City Schools and graduated as valedictorian of Athens High School. I have always had a strong interest in the physical sciences. Currently a student at Ohio University pursuing bachelor degrees in physics and chemistry, I intend to pursue a doctoral degree after graduation. I am a member of Alpha Chi Sigma, the professional chemistry fraternity, and Sigma Pi Sigma, the national physics honor society. Outside of my studies, I am an Eagle Scout and am involved with Ohio University’s Circle K chapter, a collegiate community service organization affiliated with Kiwanis International, for which I am serving as club secretary.

**Abstract:** This project investigates the passage of high-energy subatomic particles called hadrons through various types of matter and the profile of the energy they release. The main project is to use the PHENIX (Pioneering High-Energy Nuclear Interaction eXperiment) detector at Brookhaven National Lab to study the characteristics of these energy depositions, which are called showers. Analysis of these showers from a combination of PHENIX data already recorded and possibly a simulation of a new PHENIX prototype detector will be used for these studies. This will include deposition characteristics for various types of materials, which may then be used to find optimal configurations of materials for PHENIX performance, and which may also have applications for studying the effects of collisions of ultra-high-energy cosmic rays (which are also thought to be hadrons) in spacecraft materials.

**Publications:** None yet.
Matthew B. Weaver

**Status:** Junior, Electrical Engineering

**Research Topic:** Preparation of Boron Nitride Phosphor for Deep UV Solid State Light Engines for in Space Water Recycling

**Advisor(s):** Dr. Wojciech Jadwisienczak

**Biography:** Matthew grew up in West Dundee, Illinois. He is currently studying Electrical Engineering at Ohio University, where he is also involved with the Optical Society of America (OSA) and Institute of Electrical and Electronics Engineers (IEEE). He has worked as a resident assistant for a year; assisting students with daily needs and guidance in career and life impasses.

Matthew’s curiosity has led him many places, he has spent the past two summers working internships gaining valuable experience in the industry as well as a work ethic that has carried over to his studies and research. Other areas of enjoyment for Matthew include marksmanship, computer construction/modification, quantum mechanics, and photography.

In the future, Matthew is eager to work as an Electrical Engineer, using innovation to advance the quality of life. He is not fixed on a particular division of Electrical Engineering yet; but hopes to continue his pursuit of curiosity.

**Abstract:** The foundation of this project is to synthesize boron nitride (BN) nano-phosphor having good optical quality. The idea is to develop an efficient completely solid-state deep UV emitting light source for germicidal disinfection of common bacteria in potable water and space water recycling. The main project objective will be to conduct an independent experiment in mastering a simple and robust synthesis route of BN powder. The project has two major goals: (1) to fabricate and characterize BN powders using the pressurized ball milling technique available in the School of EECS at Ohio University and (2) to train Matthew in research standards, laboratory routines relevant to studies of materials (e.g. thin films of BN, graphene, diamond etc.) for space applications. The project is a part of the research initiative focused on designing completely solid-state deep UV emitting multilayer electroluminescence (MACEL) devices using fabricated BN phosphor for effective water germicidal applications. These applications will allow Matthew the ability to pursue a desired career in space industry/research and/or related fields. The importance of BN material’s use in deep space is crucial due to its extreme ionization damage resistance as well as its implementations in water recycling because of its ability to generate deep UV light close to 200 nm.

**Publications:** None yet.
Biography: Samuel Hansford was born and raised in Centerville, Ohio. He attended Centerville High School and was active in track and Boy Scouts; receiving his Eagle Scout award in 2008. He is currently a Senior in Mechanical Engineering at The Ohio State University (OSU). During his first two years at OSU, he worked at the Civil and Environmental Engineering Department. He has been researching with Dr. Samimy at the Gas Dynamics and Turbulence Laboratory since October, 2011. He held two summer internships at Yaskawa Motoman Robotics as a Mechanical Designer. After graduation with a B.S. Degree, he will pursue a Doctoral Degree in Mechanical Engineering.

Abstract: Cavities, such as landing gears and bomb bays, are abundant on current commercial and military aircraft. Cavities can also be used as a shock trap in the isolator section of scramjet. In a cavity, fluid flow impinges on the back wall of the cavity, generates an acoustic wave that travels up the cavity, and seeds the flow instabilities. This process creates an unsteady flow with resonance in a cavity that leads to high drag, structural fatigue, and high noise levels. By controlling the flow with actuators, the resonance can be disrupted and the negative effects mitigated. For use as a shock trap, resonance will need to be enhanced to prevent the combustion-induced high pressure from moving the shock train in the isolator to the inlet of the engine and potentially causing engine unstart. The Gas Dynamics and Turbulence Laboratory at The Ohio State University is using a form of control with all electronic actuators called localized arc filament plasma actuators (LAFPAs). Previous studies have shown the LAFPAs are capable of disrupting the feedback loop of the cavity, leading to a reduction in noise and drag.

The goal of this research is to demonstrate the ability of the LAFPAs in establishing resonance in a cavity and further studying the mechanism involved in cavity flows. Resonance will be enhanced by forcing the flow near the natural frequency of the cavity so seeding by the LAFPAs and acoustic wave occur nearly simultaneously. The perturbations caused by both the actuators and the acoustic wave will cause drag and noise to increase substantially thus increasing the chances of the cavity arresting a shock train. The flow will also be forced over a wide range of frequencies. By studying the change in pressure levels with pressure transducers in conjunction with flow visualization, there will be a better understanding of the underlying mechanism in cavity flows.

Publications:
Will be co-author in a journal publication, which will be submitted in February, 2013.
Biography: I am a non-traditional student, having served in the United States Army after 9/11, and transferring from the Columbus College of Art and Design, where I studied Fine Art and Time Based Media Studies. I came to Ohio State after my time in the Army and recognizing that being a Professional Artist would not guarantee a secure future for my family. I chose Engineering because I've always enjoyed problem solving and had a knack for Mathematics. I chose Aeronautical and Astronautical Engineering for two main reasons; a fascination with space and space travel, and, having gained ample motivation from the Army, I wanted to challenge myself and push my potential to its limits. I feel like the field of Aerospace and Aeronautics has plenty of challenges to behold and is a field that could benefit from an artist like myself destined to think outside of the box. I observed my intuition first hand during two internships at NASA Ames Research Center in Moffett Field, California, where cutting-edge research and development is the norm. The environment in Silicon Valley, adjacent to NASA ARC, is vibrant, progressive, and in constant flux. I was an Aeromechanics Branch Intern and worked closely with NASA Aerospace Engineers studying data from the UH-60A (Blackhawk) Airloads 2010 test campaign. I also had the opportunity to be the Safety of Flight Loads Monitor in the 40X80 National Full-Scale Aerodynamics Complex, the world's largest wind tunnel, during wind tunnel testing in conjunction with NASA, the United States Air Force, and Sikorsky Aircraft Corporation in the Spring of 2011.

Abstract: My research project aims to continue building a strong foundation in the focus of subsonic rotary wing aircraft. I have secured books to facilitate the historical perspective, and I have joined the American Helicopter Society at the recommendation of my former mentor Dr. William Warmbrodt to gain modern insight. They are holding the 69th Annual Forum & Technology Display, the world's leading international conference on vertical flight technology, May 21-23 in Phoenix, Arizona and I intend on being there. In the latter stages of my research I will focus on modern problems such as dynamic stall and its affect on limiting velocity in forward flight, as well as issues of vibration and acoustics. Additionally, I have managed to audit a class this semester on Helicopter Aerodynamics, and, with the help of the Ohio Space Grant, I have secured a position in Dr. Gregory's Research Group to facilitate wind tunnel testing in the Aeronautical and Astronautical Research Laboratories at Ohio State's Don Scott Airport.

Publications: None yet.
Achal Sudhir Singhal

Status: Junior, Mechanical Engineering

Research Topic: Drag Reduction using Nanosecond Pulse Driven DBD Plasma Actuators in Advanced Rotorcraft

Advisor(s): Dr. Mo Samimy

Biography: My name is Achal Singhal, and I am currently attending The Ohio State University. My major is Mechanical Engineering, but as I have progressed throughout the curriculum, I have really enjoyed the fluids and research portion of my studies. Continuing on this path, I plan to pursue my Master’s or Doctorate in Aerospace Engineering in the nearby future and hopefully work for NASA. I would really enjoy working on future spacecraft or continuing this research until implementation.

Abstract: This study explores plasma actuator-based flow control aiming to reduce the drag associated with the advanced rotorcraft known as slowed-rotor compound vehicles. These vehicles possess a large rotor for low speed and hovering capabilities as well as secondary propulsion systems for high speed endeavors. At high velocities, the large rotor rotates slowly to reduce bending forces. In doing so, the retreating blade introduces additional drag to the system, reducing its efficiency. It is hypothesized that nanosecond pulse driven dielectric barrier discharge (NS-DBD) plasma actuators may reduce the drag of the retreating blade by exciting instabilities in the flow over the retreating blades. Recent work with NS-DBD plasma actuators indicates its efficacy to reattach flow at high angles of attack in high flow speeds and Reynolds numbers over an airfoil. Various forcing frequencies and actuator configurations will be evaluated for flow control in the retreating blade configuration of a NACA 0015 airfoil. Particle Image Velocimetry and hot wire techniques will be employed to obtain profiles of the wake of the airfoil in the retreating blade configuration and determine drag reduction.

Publications: None yet.

Congressional District: 3rd
Congressional Representative: Joyce Beatty
Biography: I am currently a Senior in Mechanical Engineering at The University of Akron. This is my second time receiving the OSGC scholarship. I am from Massillon, Ohio, which is where I was born and raised. My entire life I have imagined ways to make things better, from bicycles to automobiles. In high school I made the decision to join the automotive program which is where I strengthened my technical skills and is where I realized that I would like to go into engineering. I graduated with honors from Jackson High School in 2007. Mechanical Engineering has been the best fit for me as a college student because I am able to combine my hands-on knowledge and the theoretical skills acquired from the classroom. Once I started college I began working full time at Summit Racing Equipment which is where I took communication and sales classes. I was able to take lessons from these classes and apply them to many different aspects of life. Working a full-time job and carrying a full school load was hard work that taught me time management. Once I obtained a co-op I was able to stop working full time during the school semester which gave me more time to focus on school and family. I completed four co-op rotations at Pneumatic Scale Angelus which is an engineering company that makes automated machines for the packaging industry. Since I had more free time I was able to become an active member in The University of Akron’s SAE Baja team. In August of 2010 I married my high school sweetheart, Angela. A few months later we adopted a Persian cat which we named Oscar and later we adopted a cat named Miko.

I am currently looking for a full-time job which I will start upon graduation. In the future I would like to go back to school to obtain a Master's Degree in Mechanical Engineering and a Master's in Business Administration. I am enrolled in a preparation class that will help me pass the Fundamentals of Engineering Exam in the spring. Once I pass the FE exam and spend a few years in the industry, I would like to take the Professional Engineering Exam to become a Professional Engineer.

Abstract: SAE Baja is a student run team that competes in off road challenges. Every year The University of Akron races in these competitions, along with many other Universities from around the world. My role this year has been to design, build and test the braking system. The requirements of the SAE Baja car’s braking system are that all four wheels must lock up on both dry pavement but also on dirt. I made rough calculations that led me to a theoretical size of rotor and pad that would be needed to meet the requirements, assuming a constant coefficient of friction between the brake pad and rotor. When I started to look for brake pads and calipers I came to the realization that hardly any information was given on the coefficient of friction for different brake pad materials or the same pad in different conditions. I knew that to be certain that the car would lock up the tires in all environments that I would need to find the coefficients and braking forces for many situations. I started out by finding the most ideal caliper and pad combination for off road use. The pads and calipers that I determined to be necessary for the car are Wilwood Engineering’s PS1 caliper with the Sintered Metallic pads. The Sintered Metallic material has proven to be the best pad compound for off road applications, the PS1 calipers were chosen due to the fact that they are among the lightest and most compact on the market, while still offering the clamping forces needed. Once I determined which components that I was going to work with I designed a test procedure which will give me data that I could use for more brake calculations. The test fixture is fairly simple. There is a controller, a motor, the pads, caliper and rotor, which simulate one stopping force for the car. The set up will be run with three different variations, the first one is a completely dry run which will yield a base line to reference, the second water will be introduced to the rotor and the third a clay/mud mixture will be used. Once the tests are run I can determine the effectiveness of these trials.

Publications: None yet.
### Biography:
As a senior at Walsh Jesuit High School, I realized that my love for mathematics, my interest in learning novel information and science, my creativity, and my desire to help people could be all encompassed in Biomedical Engineering. I am a third year undergraduate honors college student at The University of Akron with a minor in Applied Mathematics. I have maintained Dean’s List, and am on scholarship through the Honor's College, The University of Akron Scholarship for Excellence, The Increasing Diversity in Engineering Scholarship, The University of Akron Excellence in Biomedical Engineering Award, The Akron Engineering Week Scholarship, and The Italian American Professional Businessman’s Scholarship, in addition to the Ohio Space Grant Consortium Scholarship. I am a discussion group leader for Women in Engineering where I mentor female freshmen students in their first college engineering course. I enjoy co-oping in the engineering department at TransMotion Medical, a medical stretcher-chair manufacturer as part of my education. In my free time, I dance with a performing arts group, The LION Players, and had the pleasure of going to London, England to perform with them during the 2012 Summer Olympic Games. I also like to longboard, trail run, sew, play classical piano, hunt, compete in turkey calling contests, and read historical fiction.

### Abstract:
Osteoporosis is currently believed to result from an inability of bone cells to sense mechanical load with advancing age. A basic knowledge of intercellular communication and why bone degradation and regeneration occurs is critical to developing cures, treatments, and prevention therapies for osteoporosis and other bone diseases. Because the cause of bone degeneration and regeneration is uncertain, the study of mechanical strains on the bone cells and examination of how it affects cell behavior and viability can indicate how bone responds to mechanical load and what causes bone growth. A microlaoding platform of an elastic polydimethylsiloxne (PDMS) membrane is used to apply quantifiable and reproducible loads to the bone cells and cause microdamage and evaluate whether the microdamage causes dendrite destruction or cell death. The goal of this research project is to study bone cells and their response to stress and strain.

### Publications:
None yet.
Athena L. Payton

Status: Junior, Mechanical Engineering

Research Topic: Magnetohydrodynamic Flow Over a Cylinder

Advisor(s): Dr. Abhilash Chandy

Biography: I am a Junior Ohio Space Grant Recipient for the 2012-2013 academic year. I was born and raised in Cambridge, Ohio, and attended Cambridge High School. Math and science has been my passion ever since I was in elementary school. One of my hobbies is researching nanotechnology. I have done research with polymers, which involved electro-spinning nano-fibers. I also conducted tensile and adhesion tests on the fibers to determine their strength. I have had a co-op with Goodrich Sensors and Integrated Systems and was in the research and development department. At Goodrich, I have been had experience with nanotechnology for aerospace systems. I have also had a co-op at Luk USA LLC in the design department. This company specialized in making torque converters. My interest in fluid mechanics influenced me to do research with magnetohydrodynamics. Research has been a big part of my college career.

Abstract: Magnetohydrodynamics (MHD) is the flow of electrically conducting fluids in the presence of a magnetic field. The equations used for MHD are the Navier Stokes (NS) and the Maxwell Equations. These equations are accompanied by the occurrence of induced electric currents within the fluid, which will lead to Joule dissipation. The suppression of motion of these fluids by a static magnetic field is an area of increasing interest in aerospace technologies, particularly in supersonic and hypersonic flights. These flights consist of an MHD system that can potentially control the fluid dynamics at the inlet of a scramjet by bypassing kinetic energy of the working fluid from the supersonic diffuser to the nozzle. The flow velocity is reduced in the combustion chamber to acceptable value even for high vehicle Mach numbers (Ma) and to control boundary layer, shockwaves, and heat fluxes by all MHD interactions.

Publications: None yet.
Kenneth W. Smith, Jr.

**Status:** Junior, Aerospace Engineering  
**Research Topic:** Composite Bearing Cages  
**Advisor(s):** Dr. Shing-Chung “Josh” Wong  

**Biography:** My career goals, as one may point out, are pretty towering, so towering in fact, they pretty much reach space. When I was a kid I had always had an interest in astronomy and cosmology. I, as many other students, had big dreams when I was younger; the only difference is I never really grew out of them. All I remember is looking at the sky through my twenty dollar telescope thinking, “one day, I’ll be up there.”

“The future belongs to those who believe in their dreams.” –Eleanor Roosevelt. Having dreams and striving for them are two different stories entirely, and I believe that the bigger the dream, the bigger the rewards. Accomplishing a goal such as being an astronaut takes tough training, leadership skills, and intelligence.

While in high school I was captain of the baseball team, co-founder of the science Olympiad for our school, and attended various leadership conferences held in Washington DC. I have always thought of myself as a very active person in the community even in high school; it helps with my philanthropic ideals and leads also to leadership qualities. Since my senior year in high school I have been helping out children at the Nordonia Daycare here in Ohio, I have read astronomy books, helped out with parties, and played songs for the children. I finished high school in 2007 where I graduated with Honors and was accepted to The Ohio State University.

At The Ohio State University I was voted Senator of Mack Hall. I represented not just myself now, but my fellow students and I took pride in such responsibility. While senator, I helped organize the 2007 homecoming parade, breast cancer awareness month donations, and I also helped in getting big names such as Will Ferrell to put on free shows for the Students of The Ohio State University. Unfortunately, my father losing his job prevented me from staying.

I then moved back home and transferred to the closest school, Kent State University. I soon realized I could not make enough money working part time, so after a semester I took a year off to work full time so I could help out my father. After my father found a job at Nestles I returned to Kent where I took Aeronautics, Physics, and Math classes before transferring to The University of Akron for their engineering program. After my year off, I was more driven to finish school and had a newfound drive that was lacking when I first began my college career. This drive is one of my greatest strengths I have gained as a student. Since my return I have had nothing lower than an “A”, participated in speech competitions, been on the Presidents/Deans list multiple times, and joined the Honors College at Kent and The University of Akron.

Now here at The University of Akron is where I have felt the most comfortable. Here, I am part of the NASA Lunabotics design team, Rhythm and Roos (Honors a cappella group), EUREKA (Honors Engineering Association), and Tau Beta Pi which is a nationally renowned Honors Engineering fraternity. I am also cooping this semester at NASA Langley in Virginia where I will be working on the new inflatable reentry vehicle under Dr. Ralph Buehrle. I have had great success thus far in my college career, but my future goals are pretty towering and will require continued success.

*Continued on the Next Page...*
Kenneth W. Smith, Jr.  (Continued)

Abstract: Metals like steel and brass have been considered for long time as main cage materials; however, the use of reinforced polymers is becoming more widespread among many bearing applications. These materials provide several advantages, including, but not limited to: 1. good wear resistance; 2. low density; 3. operation without lubrication; 4. good chemical resistance; 5. one-step fabrication ability for complex designs.

In this study we concentrated on the mechanical, thermal, and fiber reinforcement properties of two reinforced engineering polymers, carbon fiber reinforced PES, and glass fiber reinforced nylon. The baseline for comparison is glass fiber reinforced PEEK, with one additional carbon fiber reinforced PEEK.

Publications: None yet.
Joseph P. Montion

Status: Senior, Chemical Engineering

Research Topic: Syntheses of Functional Conducting Papers with a Cellulose Nanowhiskers Scaffold and a Poly(ionic liquid) Matrix

Advisor(s): Dr. Maria Coleman and Dr. Constance Schall

Biography: My name is Joseph Montion, and I am from a small town outside of Toledo, Ohio, called Whitehouse. I was homeschooled for most of my grade school education, and I did the PSO program my senior year in high school so I could get a head start on college. I have always been greatly interested in science, which lead me to the degree I am pursuing. I am currently a second year Junior at The University of Toledo in the College of Engineering. My anticipated graduation date is December of 2014. After graduation I am planning on continuing my education in either a Master’s or a Doctoral Program. In my school career so far there are a couple things that stand out. I have completed two co-ops with The Hershey Company. During my time there I learned a lot about general plant process and even more about chocolate making and the science behind it. Working in the industrial setting was a very good experience and it helped me decided on what I want to do after college. The other thing that stands out is my research that this program has been funding. This opportunity has allowed me to learn different laboratory techniques and let me learn how to use different pieces of lab equipment. Doing this research is what really gave me to pursue an advanced degree after my undergraduate.

Abstract: The overall goal of this project will be to synthesize conducting papers that can have applications in actuators, sensors, and separations media. This will be an extension of work already done by Dr. Coleman’s group with carbon nanofibers embedded within an elastomer matrix. This project will attempt to synthesize and process functional conducting papers with a cellulose nanowhisker scaffold and a poly(ionic liquid) (IL) matrix. The first step will be to isolate cellulose nanowhiskers from cotton linters using the IL 1-allyl-methylimidazolium chloride. The next step will be to spin the Poly ionic liquid/cellulose Nanowhiskers into fibers either by using fiber spinning or electro spinning techniques. These fibers will be used to form Functional Papers, which will be characterized using conductivity and actuation tests.

Publications: None yet.

Congressional District: 5th
Congressional Representative: Robert E. Latta
Biography: I am Taurean J. Young, a student at the University of Toledo, majoring in Mechanical Engineering and pursuing a minor in Business Administration. I was born and raised in Dayton, Ohio, where I was introduced early to engineering growing up next to the Wright-Patterson Air Force Base. Since I was young, I have always had an interest in aviation, aerospace, and automotive fields. Motivated by this interest, I decided to attend The University of Toledo for their curriculum and co-operative education program. Because of this co-operative education program, I have been able to gain experience in lean engineering with a co-op at Parker Hannifin, Hydraulic Filtration Division, in Metamora, Ohio. I have also been able to conduct research on a nanostructured bio-fuel cell under Dr. Yong Gan here at The University of Toledo.

Also during my tenure at the University, I have been able to get involved in various professional and social organizations. These organizations include the National Society of Black Engineers (NSBE), of which I am the current President; the American Society of Mechanical Engineers (ASME); and Alpha Phi Alpha Fraternity, Inc., where I serve as the current Education Activities Director. Following my BS in Mechanical Engineering, I plan to either work in the field of aviation/aerospace or attend graduate school to specialize in Aviation/Aerospace Engineering.

Abstract: This research is part of a larger project centered on exploring the feasibility of using origami-inspired folded structures as the cores of composite sandwich structures which are auxetic (i.e., have negative Poisson’s ratios). Auxetic materials are known to have many enhanced mechanical properties and auxetic composites have many potential applications in several industries including aerospace, automotive, and construction. This project will use finite element analysis to study the influence of an auxetic core on overall composite properties, and will also involve mechanical testing and imaging of the Aramid paper to be used for the foldcores.

Publications: None yet.
Stephen J. Marone

Status: Junior, Mechanical Engineering
Research Topic: Development of an Efficient Tool to Modify Turbomachinery Grids

Advisor(s): Dr. Duane R. Hixon

Biography: I am a recipient of the Junior OSGC Undergraduate Scholarship for the 2012-2013 school year. I started in Cuyahoga Community College when I first graduated high school. Originally, I did not know where I would want to set my career, so I majored in general business. As my schooling continued I found a heightened interest in mathematics and even more into theory. After some research I decided to continue my school career by pursuing an education from The University of Toledo in Mechanical Engineering.

With every lesson it has given me, the university has done nothing but shape me into a great engineer. Ever since I started in August of 2009, all the courses I have taken amplify my interest in the career. Along this time I have delved into a few different fields of Mechanical Engineering (structural, automotive, thermal, aeronautical, and aeroacoustics) and I have not decided firmly on a field to stay in. Although I may seem I do not have direction in this, I feel that while I have been learning about all these separate fields my abilities to grow in each new field I merge into grows exponentially. By the time I find where I am needed I am certain I will be more than able to aid to the science in extremely large amounts.

Abstract: In this work, the existing AFRL GridWarp software package for deforming the volume grids used by Computational Fluid Dynamics (CFD) codes will be extended for use with turbomachinery grids. To accomplish this, the GridWarp code will have ‘guiding surfaces’ added, which will allow the user to modify the shape of rotor and stator blades while keeping the shape of the hub and shroud surfaces unchanged. A method to determine and adjust volumetric points that intersect surfaces will be incorporated too.

The GridWarp code will be revised to give higher computational efficiency and allow larger deformations to be specified. Tools such as a Runge-Kutta and a specialized binary tree are also being created to improve this code so that these revisions may be finished properly.

Publications: None yet.

Congressional District: 16th
Congressional Representative: James B. Renacci
Brittany M. Wilkewitz

**Status:** Junior, Chemical Engineering

**Research Topic:** Sustainable Polycarbonate Nanocomposites

**Advisor(s):** Maria Coleman

**Biography:** I am pursuing Bachelor's Degree in Chemical Engineering at The University of Toledo in Toledo, Ohio. During my senior year in high school I began to develop a love for math, science and space. As soon as I chose The University of Toledo I knew it was the right fit. I spent the summer of my freshman and sophomore working at NASA Glenn Research Center where I began to develop my interest in space materials. I was able to work with several others in the space propulsion building for flight testing in vacuum chambers. It was through these experiences that I decided to work with Dr. Coleman on sustainable polycarbonate nanocomposites. I believe it is important in our world today to look at more useful ways of using the materials that are at our disposal. Aside from doing the daily school activities though, I thoroughly enjoy teaching Pilates at our university's recreation center, bike riding and reading. I hope that after I graduate I will be able to work with space materials/composites at NASA that will help the future of our country's space program.

**Abstract:** For my research project I will be looking into more sustainable approaches to the synthesis of polycarbonate based nanocomposites. Composites produced with nanofillers, such as alumina nanowhiskers, carbon nanofibers, and carbon nanotubes can alter the way the base polycarbonate behaves, such as its transparency, UV absorption and strength. The polycarbonate we are using is Bisphenol A polycarbonate which is a commercially produced polymer with attractive properties. The base polycarbonate will be blended with two nanofillers that are at our disposal and characterized for thermal-mechanical properties. I will be also investigating life cycle analysis of each nanocomposite to compare environmental impacts as a function of nanofiller loading and type.

**Publications:** None yet.
Coupling Computational Fluid Dynamics (CFD) Analysis and Optimization Techniques for Scramjet Inlet Design Optimization

Dr. Awatef Hamed

I am currently a Senior undergraduate Aerospace Engineering ACCEND student at the University of Cincinnati (UC). As an ACCEND student, I will earn both my Bachelor’s and Master’s Degrees in Aerospace Engineering in approximately five and half years. During the first two of my four undergraduate co-op quarters, I worked for Dr. Awatef Hamed at UC, on projects pertaining to both thermal barrier coating erosion of subsonic axial-flow turbines and CFD analysis of shock-wave boundary layer interactions near bleed holes in supersonic inlets. During the latter half of undergraduate co-op quarters, I worked at GoHypersonic Inc. in Dayton, Ohio, where I expanded the functionality and improved the computational performance of GoHypersonic's in-house supersonic and hypersonic vehicle design tool. My co-op rotations at both UC and GoHypersonic Inc. spurred my interest in high speed fluid dynamics and propulsion. Thus, my research focus for my Master's is CFD analysis and design optimization of hypersonic vehicles and propulsion.

For expedience and simplicity the base geometry used for testing and development consists of a 2-D double compression ramp configuration with a fixed contraction ratio and throat height. In an effort to allow for future expansion of the design tool, the geometry is represented as a non-uniform rational basis spline (NURBS) curve allowing for flexibility in the 2-D inlet design as well as a simple conversion to 3-D geometry in the form on a NURBS surface. The optimization response function is a combination of the maximum ratio of throat pressure to free-stream pressure and the maximum flow rate per unit area. The computation tools for this research include: the NPARC strategic alliance WIND-US code for CFD solutions and the DAKOTA multilevel parallel object-oriented framework for design optimization.

None yet.
Fuzzy PID Control System for a Pitch Attitude Hold System in a Fighter Jet


dr. Kelly Cohen

Raised in Medina, Ohio, I graduated from Cloverleaf High School in 2008. I currently attend the University of Cincinnati where I am a Senior majoring in Aerospace Engineering. I excelled in math and physics in high school and physics since been my favorite subject therefore I knew I would excel in engineering. I choose the University of Cincinnati partially because of the cooperative education program and also partially because I loved the campus.

While at the University of Cincinnati, through the co-op program, I have had the opportunity to work at BGI, LLC, a defense contractor in Akron, Ohio, where I learned C++ and worked on creating a flight simulator computer program. During my time at BGI I also created a working glass cockpit display for a helicopter that was later integrated into a part of the flight simulator program. Through the co-op program, I also had the opportunity to work at GE Aviation, where I worked as an assembly engineer in the development and test organizations and as a services co-op in the GEnx services organization. While at GE in the development and test organizations I was able to work hands on with full engines as well as engine components and see the components in test situations. While working in GEnx services I was able to get more experience and insight to the business side of engineering by working on engine time on wing predictions which would then be used for negotiating service deals with customers.

Outside of school I am active in the community and I enjoy volunteering with children and tutoring students. After graduation I would like to pursue a career in which I can make a positive influence on the world through improving the safety quality in the aeronautic and aerospace industries.

Abstract: Fuzzy logic allows for grayness, in the form of the full spectrum of numbers between 1 and 0 to be taken into consideration, as opposed to binary logic where only 1’s and 0’s may be used. This consideration allows fuzzy logic to have much more robust control laws than a conventional PID controller. An attitude control system for a fighter jet or for a UAV autopilot has a dynamic range of values which must be able to be controlled in a short amount of time. Through this research the effectiveness of a fuzzy PID control system based pitch attitude hold system for a F-4 fighter jet is examined and compared to the non-fuzzy approach. A fuzzy logic based PID controller has the potential to remain effective for multiple flight conditions and increase the performance of the controller. The same topic was addressed by Lt. Col. David E. Bossert and Dr. Kelly Cohen in their 2002 paper, *PID and Fuzzy Logic Pitch Attitude Hold Systems for a Fighter Jet*, but their approach was comparing a conventional PID controller to a conventional fuzzy logic controller, while the approach designed here is using a hybrid fuzzy PID controller. The results from the hybrid system are also compared to the results published in Dr. Bossert’s and Dr. Cohen’s paper.

Continued on the Next Page . .
Abstract: (Continued)
The method for creating a generic fuzzy PID control system used is described in Introduction to Fuzzy Systems by Guanrong Chen and Trung Tat Pham, published in 2006. In this research, first, fuzzy PID control systems were investigated using Chen and Pham's book. Next, a fuzzy PID control system that could be used for a pitch attitude hold system for an F-4 fighter jet was designed using a Simulink model. The results from this control system were then compared to conventional PID and conventional fuzzy logic results, generated by Lt. Col. Bossert and Dr. Cohen. The goal is for the fuzzy PID control system to converge rapidly to zero steady-state error without compromising stability and performance for a wide range of flight conditions.

Publications: None yet.
Biography: I am currently a Senior Aerospace Engineering student at the University of Cincinnati (UC). I graduated from Avon High school in 2008 and chose to attend UC, in part because of its cooperative education program. My interest in Aerospace Engineering stems from an interest in math and science, specifically physics, biology, astronomy, and technology. The combination of such subjects was enticing and has allowed me to find great enjoyment in this field to date.

During my time spent at the University, I have gained research experience in several areas. Most recently, I have done research in the area of flapping flight micro air vehicles under OSGC support. I have examined the validity of using theoretical equations to predict the optimal flight speed of birds in nature, and have investigated the feasibility for flapping flight MAVs to perform an extended useful mission. Previously at UC's Gas Dynamics and Propulsion Laboratory, I assisted with construction and disassembly of a small-scale pulse detonation engine, and observed and helped execute several testfirings of various PDE configurations. In the area of jet noise reduction, I helped with the preparation and execution of flow-field measurement tests on various nozzle configurations, and created scripts to process and analyze particle image velocimetry data.

I have had five co-op rotations at the Air Force Research Laboratories at Wright-Patterson Air Force Base. My first rotation was with the Flight Test and Evaluation branch (RBCT), during which I reviewed flight test plans to ensure safe and effective testing. My past two co-ops have been with the Control Sciences branch (RQQA) where I developed a six-degree-of-freedom nonlinear dynamics model for hypersonic vehicles, and created a software package capable of generating the surface geometry of hypersonic vehicles for use with 3D vehicle analysis tools. I have plans to continue my work in the area of hypersonic vehicles with AFRL while I pursue a Master of Science degree in the area of Aerospace Engineering.

Abstract: Air-breathing hypersonic vehicles are highly complex systems in which the airframe, aerodynamics, and propulsion system dynamics are highly coupled. The high flight velocities (greater than Mach 5) and complexity of these vehicles cause the dynamics to differ greatly from conventional aircraft. For this research project, I will give an overview of hypersonic flight and discuss the challenges associated with the modeling, guidance and control of such vehicles. I will then present an overview of my recent work in the area of dynamic modeling and geometry modeling for hypersonic vehicles.

Constructing physics-based models of the dynamics of hypersonic vehicles allows for the simulation of flight at various conditions, and serves as an important step in the design of guidance and control laws. These dynamic simulation models often require knowledge of the aerodynamic and thrust forces acting on the vehicle over a range of flight conditions. These forces are governed by the dynamics of the flow as it passes over the surface of the body and through the engine, and can be computed by a variety of methods. However, a three-dimensional model of the surface of the body must first be generated.

Continued on the Next Page...
Tyler J. Vick  (Continued)

Abstract:  (Continued)
I have recently developed software tools for both dynamic modeling and geometry modeling of hypersonic vehicles, the latter of which will be the focus of this project. I will present the process I used to quickly and efficiently generate arbitrary vehicle surface meshes based on simple user-input parameters. I will also discuss how this geometry model can be used in the computation of aerodynamic and engine forces and moments, and how this can be incorporated into the process of guidance control law design.

Publications:
Alex R. Walker

Status: Senior, Aerospace Engineering

Research Topic: Fuzzy Attitude Control of a Magnetically Actuated CubeSat

Advisor(s): Dr. Kelly Cohen

Biography: I was born and raised in Sandusky, Ohio, where I attended Perkins Local Schools and graduated from Perkins High School. In school I excelled in science and math which naturally attracted me to pursue a degree in Engineering. However, it was the extremely close proximity of my childhood home to NASA Plum Brook Station that instilled in me a strong interest in the nation's space program and space flight in general, leading me to pursue a career in Aerospace Engineering. The decision to attend the University of Cincinnati (UC) to pursue my degree was easy, because UC offers a great Aerospace Engineering program, has an excellent co-op program, and is the alma mater of both of my brothers.

In my time at UC, I completed five co-op rotations with Sierra Lobo, Inc. in Milan, Ohio. On co-op, I gained a wide variety of experience in the preliminary design and practical implementation of piping and pressure vessel systems for cryogenic and non-cryogenic fluids. Additionally, I supported research and development efforts with Sierra Lobo’s Reduced Gravity CryoTracker® and with a CubeSat-based fluid management experiment. In December 2012, I graduated from the University of Cincinnati with my Bachelor’s degree in Aerospace Engineering. Currently, I plan to continue my education at the University of Cincinnati to obtain my Master’s Degree in Aerospace Engineering with a focus in Dynamics and Controls. My thesis topic is a fuzzy logic-based attitude control system for a CubeSat. I plan to complete my Master’s Degree by the end of the 2013 Summer Semester.

Abstract: The goal of this research is to develop a fuzzy logic system based on an optimal control law for a 3U CubeSat whose primary mission requires it to assume a nearly-exclusively sun-pointing orientation, allowing for some occasional small-angle maneuvers away from this sun-pointing orientation. Additionally, the CubeSat of interest is assumed to utilize magnetic actuation as its only means of attitude control. Ideally, the control algorithm should also minimize its power consumption both for energy use and thermal management considerations.

CubeSats are a popular means by which to conduct small-scale experiments in space. They are relatively inexpensive to build and launch, costing on the order of tens of thousands of dollars to millions of dollars. However, the limited size of CubeSats, currently up to 10 cm X 10 cm X 30 cm, makes designing some missions difficult. One option to increase the available size for on-board experiments is to reduce the size of other subsystems. For attitude control, one of the lowest-profile actuation methods is exclusively magnetic actuation; momentum/reaction wheels are both larger and more massive than magnetorquers. However, fully magnetically actuated spacecraft are underactuated and thus not guaranteed to be controllable. Another way to reduce the attitude control system footprint is to decrease the complexity of the control algorithm, thus decreasing the physical space required for hardware to execute the algorithm. As a universal approximator of nonlinear mappings of observable and controllable systems, fuzzy logic is a promising means by which to decrease complexity of a nonlinear, ideally optimal, control algorithm.

Publications: None yet.
Biography: I was born in Kirchheimbolanden, Germany, in 1991, and grew up in Cincinnati, Ohio. I graduated from Walnut Hills High School in 2010 and, following my passion for math and physics, immediately enrolled in the University of Cincinnati, where I have since majored in Aerospace Engineering. I have done contract work for organizations as diverse as the International Chemical Workers Union, the University of Cincinnati, and NASA, and I am Cincinnatus Scholarship winner. His current main interest lies in the field of dynamics and controls, and during my time at UC I have completed two research co-ops centered on just that. The first of these co-ops was an exploration that focused on gauging the potential of data-mining using fuzzy logic systems; the second co-op was done as part of a research project completed with the NSA, and consisted of an investigation into techniques for system identification of quadrotors.

Abstract: Fuzzy logic is a powerful and versatile mathematical tool that is useful for controls engineering. Fuzoku is an application programmed in MATLAB that solves Sudoku puzzles of any shape or size through implementation of the principles of fuzzy logic. All assumptions about Sudoku are eschewed in favor of a system that analyzes a Sudoku puzzle and then solves it cryptically, much like a human would. The great advantage of this approach lies in its ability to scale—typical logical or brute-force solvers rely on the inflexibility of the puzzle; however, certain Sudoku variants alter the shape of the puzzle, the shape of the nine sub-groups, or change the size of the puzzle. When faced with these variants a traditional solver is useless. Fuzoku, however, views the puzzle not as a whole, but as a collection of the individual squares that are each defined according to their relations to one another—squares that share a row, column, or subgroup cannot have the same value. By reducing the puzzle to first principles, it then becomes possible to contrive a solution organically through careful iteration, no matter what variant has been imposed on the puzzle. The goal of this research is to demonstrate the use of fuzzy logic in obtaining results dynamically from cryptic puzzles using only a scant understanding of the basic rules.

Publications: None yet.
Sophia M. Mitchell

Status: Junior, Aerospace Engineering

Research Topic: Comparison of Fuzzy Optimization and Genetic Fuzzy Methods in Solving a Modified Traveling Salesman Problem

Advisor(s): Dr. Kelly Cohen

Biography: Sophia Mitchell is a third year student in the Aerospace Engineering dual Bachelor’s and Master’s (ACCEND) program at the University of Cincinnati. Since the age of six, Sophia has been fascinated by space and hopes to someday be an astronaut. She is currently working on several research projects in the area of fuzzy intelligence, and believes that this area has many meaningful real-world applications. She expects both her Masters and possible PhD theses to be in this area. Her current co-op rotation is with NASA Jet Propulsion Laboratory in Pasadena, California, and she hopes to work there in the future for her career.

Abstract: There are a growing number of applications demonstrating the effectiveness of emulating human decision making using fuzzy logic. Main research challenges include situational awareness and decision making in an uncertain spatio-temporal environment. A very well-known problem called the travelling salesman problem was built on in this study to determine if a fuzzy optimization tool could be developed, and if so how it could improve results and how the optimization could be improved. The given simulation had an added level of uncertainty, which is common in real-world applications, as the solution to the simulation had to be for a single-depot, polygonal (or circular), Dubins path 4 UAV time-optimal TSP problem. Developments in this area could greatly improve the abilities and efficiency of intelligent reconnaissance, scientific and transportation systems. In a previous research endeavor, a fuzzy method was designed to find the shortest path through the modified travelling salesman problem where it touched each target area at least once before returning to its starting position. This fuzzy optimization system was statistically successful in decreasing the path distance by at least 5% in all cases. For this study, the algorithm will be developed to not only include Dubins path estimates and another layer of optimization, but to also control four “salesmen” making this a multi-travelling salesman problem. To test for effectiveness, this created fuzzy optimization code will be compared to a code that was developed to solve the min-max multi-depot multiple traveling salesman problem. Here a genetic fuzzy system was utilized in combination with a previously created solution for large-scale multi-depot polygon visiting Dubins multiple traveling salesman problem to develop a time-optimal solution for large scale vehicle routing problems. By comparing these results, it will be possible to better understand what the optimal use of fuzzy logic is in a multi-travelling salesman problem, as well as point out what future developments could be made that would make the prevailing method even better.

Publications:
Nicholas J. Schwartz

Status: Junior, Aerospace Engineering
Research Topic: System Identification of Quadrotors for Simulation and Control
System Development

Advisor(s): Dr. Kelly Cohen

Biography: I am currently a Junior Aerospace Engineering student at the University of Cincinnati (UC). Born and raised in Miamisburg, Ohio, I graduated from Miamisburg High School in 2009. In school, I excelled in my math and science courses, which attracted me to pursue a degree in Engineering. However, it was my experience of completing the Aviation merit badge in Boy Scouts where I discovered my passion for aircraft. These experiences led me to take a specific interest in studying Aerospace Engineering. With UC’s distinguished Engineering and co-op programs, my decision to attend UC as an undergraduate was an easy one to make.

Through my time at UC, I have completed three co-op rotations at Gulfstream Aerospace Corp. in Savannah, Georgia. During my co-op rotations I have had the ability to work in different groups within the company, allowing me to gain hands-on experience in a variety of areas. In my first rotation I worked in the Flight Deck and Furnishings group, where I gained experience using Computer Aided Design (CAD) software to virtually model various cockpit components and installations. During my second rotation I worked in the Flight Dynamics group for the G650 program, where my main task was extracting G650 flight test data for simulation purposes. In addition, I developed MATLAB scripts that compared simulation outputs versus flight test data for FAA certification purposes, and had the opportunity to lead simulator tests for Gulfstream and FAA pilots. On my most recent rotation I worked in the Applied Aerodynamics group, where I used Computational Fluid Dynamics (CFD) computer programs to validate wind-tunnel test data and predict loads present on an aircraft at various flight conditions.

I will be graduating with my Bachelor’s Degree in April 2014. It is my desire in the future to obtain a Master’s Degree in Aerospace Engineering, with a focus in either Aerodynamics or Dynamics and Controls.

Abstract: In the aerospace industry today, there is a large focus on aircraft simulation. By having the ability to train pilots on the ground, simulators provide both safety for pilots as well as cost savings and efficiency for companies. With simulators, pilots are able to practice emergency situations without fear of crashing, providing confidence should an actual emergency arrive in flight. In addition, simulators allow multiple pilots to train simultaneously, which greatly saves flight costs. In order to develop an accurate simulator, a precise mathematical model of a particular aircraft or rotorcraft is essential. With today’s technology and software, a mathematical model of an aircraft or rotorcraft can be extracted directly from flight test data, a process called System-Identification. The purpose of my research is to obtain a better understanding of how these mathematical models are obtained through System Identification using quadrotors.

Continued on the Next Page . . .
Nicholas J. Schwartz  (Continued)

Abstract:  (Continued)
My research involves using the software CIFER®, which uses frequency response analysis to develop a mathematical model of an aircraft or rotorcraft. Through the first stage of my research, I instrumented a Parrot AR Drone quadrotor to wirelessly record necessary flight test parameters required for CIFER® model extraction, without drastically affecting its dynamics. In addition, I worked to develop a MATLAB Graphical User Interface (GUI) that greatly streamlined the data collection process during flight-testing. This system was utilized during flight-testing of the AR Drone quadrotor and was successful in providing required data to CIFER®, which extracted a valid mathematical model of the quadrotor. The second stage of my research involved the System-Identification of an AeroQuad quadrotor. Using XBee communication devices and onboard instruments, I designed a MATLAB GUI to wirelessly record data during flight-testing. This system was utilized during flight tests of the AeroQuad, and a mathematical model is to be extracted using CIFER®. Using additional flight test data, a validation of the AeroQuad mathematical model is to be carried out by comparing flight test outputs to simulation outputs. The instrumentation setup, results of flight tests, CIFER® model extraction, and validation processes are to be presented.

In the future, a custom control system is to be designed and developed for the AeroQuad. The mathematical model obtained through CIFER® will be an important asset in testing the effectiveness of various control system designs by simulating the quadrotor’s response.

Publications:  None yet.
Winston L. Black, II

**Status:** Senior, Chemical Engineering  
**Research Topic:** Biogenic Fabrication of Silver Nanoparticle by *Shewanella oneidensis*

**Advisor(s):** Dr. John G. Weber and Dr. Donald Comfort

**Biography:** Winston L. Black, II, is a 22-year-old Senior Chemical Engineering major at the University of Dayton (UD). Winston hails from Kirkwood, Missouri, a suburb of St. Louis where he grew up as the middle child of Leopold and Donna Black’s three children. He attended Kirkwood High School before coming to the UD. At UD, Winston is the president of the university’s chapter of the National Society of Black Engineers. He also has worked as a tutor for the Dean’s Office in the School of Engineering, a teaching assistant for the chemical engineering department and as a resident assistant for the Department of Housing and Residence Life on campus. Once he obtains his Chemical Engineering degree in May of 2013, Winston will pursue a PhD in Chemical Engineering with a concentration in materials, renewable energy or environmental engineering. He has applied to Lehigh University, The Ohio State University, Carnegie Mellon University, Cornell University, Washington University in St. Louis, Purdue University, Georgia Institute of Technology and Clemson University. Thus far, he has been accepted to Cornell.

**Abstract:** As applications grow for nano-particles in the fields of resistant materials and electronics, the inexpensive and easy fabrication of these particles becomes more and more crucial to these new technology’s affordability and production for everyday consumers. This work explores *shewanella oneidensis*, a well characterized laboratory bacterium, as a means of fabricating silver nano-particles. Silver nano-particles are valued for their uses in anti-bacterial and anti-microbial materials. Incubated in silver nitrate solution, these bacteria produce silver nano-particles as a defensive mechanism. Batches of nano-particles were produced and examine via UV-Visible spectroscopy and electron microscope imaging. Further work will attempt to characterized the mechanism by which S. *oneidensis*, reduce the silver ions into silver nano-particles. Additional work could also explore at what concentration of silver nano-particles is a lethal dose to S. *oneidensis*.

**Publications:** None yet.

---

**Congressional District:** 10th  
**Congressional Representative:** Michael R. Turner
10th Congressional District: Michael R. Turner

Biography: Hello all, my name is Eric M. Fuerst, and I am a Senior Mechanical Engineering student at the University of Dayton, focusing in Aerospace Engineering. I am from a suburb of Cleveland, Ohio, called North Olmsted. Prior to college, I attended North Olmsted High School, graduating with honors, during which time my interest in physics grew, leading me to pursue a Mechanical Engineering degree. My focus in Aerospace stems from my passion for airplanes.

At the University of Dayton, I have been able to explore my passion through undergraduate research with guidance from Dr. Aaron Altman and through student internships at the Air Force Institute of Technology (AFIT) at Wright Patterson Air Force Base (WPAFB). Via undergraduate research, prior to the OSGC Senior Scholarship, I assisted a graduate student with aerodynamic research of Micro Air Vehicle (MAV) interaction with stationary objects. This opportunity led to my interest in conducting research of my own. With this opportunity, my background as a researcher will have a strong foundation and I will be better prepared for graduate studies in the Fall of 2013 and further, a career in the aerospace industry.

Abstract: During maneuvers at high angles of attack (α) such as landing and taking-off, boundary layer separation occurs, starting at the trailing edge (TE). Propagating upstream toward the leading edge (LE) of the airfoil follows. Because the majority of lift is generated within roughly the first ten percent of the chord, it is crucial that separation does not reach this region of the airfoil. When the airfoil can no longer generate enough lift to sustain flight due to separation at high α’s, α stall occurs.

After conducting an in-depth literature review, research from the Technical University of Berlin in 2004 was found to be very similar to the proposal composed for this project. From that research, the baseline study was composed and testing is being prepared for the Spring of 2013. Two airfoils will be fabricated, an Eppler 423 and a NACA 0012, respectively a cambered and a symmetrical airfoil. These will be tested first without upper-surface, trailing-edge flaps followed by experiments with the artificial covert feathers at a small, subsonic wind tunnel at WPAFB Air Vehicles Directorate.

Publications: None yet.
Leslie A. Sollman

Status: Senior, Mechanical Engineering

Research Topic: Bleed Hole Location, Sizing, and Configuration for Use in Hypersonic Inlets

Advisor(s): Dr. Aaron Altman (UDayton), Dr. Lance Jacobsen (GoHypersonic Inc.)

Biography: I am a 2012-2013 Senior recipient of the Ohio Space Grant Consortium (OSGC) Scholarship. I am from Beavercreek, Ohio, and graduated with an honors diploma from Beavercreek High School in 2008. While in high school, I was selected for the highly competitive Wright Scholar program, an academic-based student employment program, sponsored by The Air Force Research Laboratory (AFRL) and partnering with the University of Dayton (UD). My experience in the Wright Scholar Program contributed to my decision to pursue a degree and career in engineering. I decided to put my mathematical and science skills and love of aviation to use by pursuing a Bachelor Degree at UD in Mechanical Engineering with a concentration in Aerospace Engineering.

At UD, I was able to see my engineering knowledge put to use in practical applications through senior design projects and our school's Aero Design Team. While at UD, I participated in the co-operative education program worked with the Propulsion Directorate of AFRL. My research for the Ohio Space Grant Consortium Scholarship was strongly influenced by my work with AFRL. I recently graduated from the University of Dayton in December 2012 and am currently pursuing a Ph. D. at Georgia Tech in Aerospace Systems.

Abstract: Flight in the hypersonic regime, approximately five times the speed of sound, has been of interest to militaries and commercial aviation enthusiasts for many years. Hypersonic airbreathing vehicles are desired for efficient long range cruise missiles, global reconnaissance, and access to space as they promise higher efficiency than current technology. They also enable reusability with the goal of obtaining cheaper methods of defense and transportation. Although there have been a few recent successes with government funded hypersonic programs, many technology gaps still exist and must be investigated before further progress can be accomplished for hypersonic vehicles. One of the limiting factors in the robustness of a hypersonic airbreathing engine involves starting inlets. In order to achieve sufficient combustion during flight, a vehicle must have a started inlet, an inlet in which there is no strong bow shock, no flow separation, and flow is not significantly disrupted by turbulent forces. There have been many techniques implemented to start an inlet such as retractable doors, variable inlet geometries, and mass extraction through perforations. Although the aforementioned techniques are all viable solutions, permanent perforations for mass extraction are arguably most beneficial, assuming sufficient mass capture remains, due to ease in manufacturing and weight reduction of the overall inlet. This paper analyzes the Molder Theory, a technique for developing bleed holes for mass extraction using necessary spillage area per unit length and the Kantrowitz Limit for hole spacing. To test the theory Computation Fluid Dynamics using Cart3D, a Cartesian inviscid code, was completed on a simple axisymmetric Busemann inlet with various bleed hole configurations. Results show that hole spacing using the Kantrowitz Limit for inlet starting are slightly more efficient in terms of overall mass capture than holes evenly spaced along the length of the inlet. Hypersonic wind tunnel tests are to be completed with a GoHypersonic Inc. axisymmetric Busemann scramjet inlet using the Kantrowitz Limit and Molder Theory for bleed hole configuration design. Experimental results were obtained for validation of the Molder Theory and Kantrowitz Limit for use in bleed hole configuration design and are discussed in comparison with computational results.

Publications:

Congressional District: 10th
Congressional Representative: Michael R. Turner
Christopher A. Adams

Status: Senior, Electrical Engineering

Research Topic: Radio Frequency Automated Control System for Automobile Application

Advisor(s): Dr. Edward Asikele

Biography: I am a passionate engineer who inspires to innovate, and create. Someday I hope to make the world a better place by finding a form of sustainable energy, this concern is regarding our ozone depletion crisis. This can only be done through my opinion by utilizing nuclear power as our world’s top sustainable energy. That passion has led me to study Electrical Engineering as a major, and Nuclear Engineering as a minor. I have interned with several companies like: National Nuclear Security Administration, Cintas Corporations research and development department (a branch of the Engineering Department), etc. At Cintas, I created the invention to effectively test the coefficient of static and kinetic friction on various floor types for one of their products. I have received certification for Radio Frequency Identification system installations and operation. I plan on attending the Ohio State University for grad school with determination to complete the Nuclear Engineering program for a master degree, and the Electrical Engineering program for a master degree as well. With that I will plan on going into a business of my own designing graphite water reactors, or the common PWRs or BWRs.

Abstract: I am researching the methods for reception of frequency signals via a millimeter wave imaging system that is often used in airports. With this research I plan to find a way to implement the Ladar concept that uses phased arrays which was created by researchers under the DAPRA program. This system will be used to enhance our airports security by giving us the ability to sense explosive that emit small and barely noticeable RDX fumes. With the MMW imaging system, it will give us the ability to view weapons and metallic objects on passengers as they wait in line. With the signal reception from either detector we plan to send that signal to a digital display that can be viewed and operated by its users. I hope and plan for our research to continue to automobile displays for police officers, firefighters, and helicopters; in some cases even personal mobile electronic devices.

Publications: None yet.
Biography: My name is Mahogany Williams, and I am a current Senior majoring in Computer Engineering from Indianapolis, Indiana. I am currently a student leader which allows me to remain focused so that I may be a model for others to follow. On my campus I am currently involved as a Residential Assistant, member of Zeta Phi Beta Sorority, Inc. (President), Black Women United (Historian), and a mentor for the mentor/mentee program. I have always taken pleasure in math and technology and that is one reason why I decided to choose this particular field of engineering. Upon graduating I want to use my minor degree in Nuclear Engineering to be an operator of a neighboring power plant.

Abstract: Computer software can be used to analyze, interpret, and understand the characteristics of the UAVs (unmanned aerial vehicle). Unmanned Aerial Vehicles are air vehicles and associated equipment that does not carry a human operator. Instead, it flies autonomously or piloted by a remote controller. The earliest form of a UAV was in the form of a balloon around 1782, by the Montgolifier brothers in France. Most aeronautical experimenters built models off their designs in order to discover if they could work. In, 1848, John Stringfellow and William Henson from England combined their talents in 1848 to build a steam powered propeller and the model successfully flew a distance of 60 yards. The continuing observation of UAVs and applying of more skills can help prevent accidents that occur.

Publications: None yet.
Biography: My name is Dahrion Johnson, a Senior majoring in Computer Engineering with a minor in Nuclear Engineering. I was born and raised in Detroit, Michigan, where I graduated from Southfield High School. I came to love computers at a very young age when I took apart a play station system to “fix” the disc reading laser. In high curiosity, I went from the play station to the Nintendo 64 and from the Nintendo 64 to the Xbox and CPU. Once having my overall fascination with microprocessors and nodes and conductors and inductors, I then yearned for a greater knowledge so I went to Wilberforce University to obtain a Bachelor’s Degree in Computer Engineering. My overall goal is to continue to expand my knowledge of engineering in hopes of one day being satisfied with my learnings.

Abstract: Choosing my research topic for the Ohio Space Grant Consortium all started with an idea. As I watched i,Robot, I thought what if we could build robots that functioned like the ones in the movie. I then became curious as to how the robots would pass information through the body. I broke down the idea in the movie and gathered the realization that the bundles that made up Sunny’s arms would have to be fiber optic cables. So I then realized I would have to learn how fiber optics worked. I started by seeking the assistance of a professor that studied fiber optics in his schooling days. Dr. Kette was happy to explain that fiber optic cables passed information from one point to another, and that certain cables carried information a certain length. He urged me to do my own research, and if I had any questions to come to see him.

In a book that I purchased with my book voucher entitled “Understanding Fiber Optics” by Jeff Hecht, I found that like many different creation fiber optics had its problems such as the fact that smudges and scratches on the surface of the glass could lead to information escaping. This is why they are now encased in a plastic cladding cover. I’m currently continuing my research and look forward to sharing what I’ve learned with the world given future opportunities.

Publications: None yet.
Marie A. Hammock

Status: Senior, Biomedical Engineering
Research Topic: Rehabilitation Engineering
Advisor(s): Amy Doll

Biography: I began at Wright State University in the Fall of 2008. Although I wanted to attend a school with pharmacy as a major, I considered biomedical engineering instead. As I embark on this project I am happy that I choose the engineering discipline. I never imagined that rehabilitation would be a part of engineering. This project is giving me a newfound love for engineering and further lets me know that there are endless possibilities in this field.

Abstract: With this project a hands-free telephone interfaces will be created; not speakerphone, but VOX set that is compatible with employer telephone system and is also easy to use for consumers that have limited use of their hands. Maria has muscular dystrophy and has been in a lying position since 1990. Maria is in her current wheelchair 16 hours each day, and overnight on weekends (resulting in 36-40 straight hours in the wheelchair). Her current wheelchair last underwent re-design in 1995. A number of mechanical and electrical, as well as computer access and environmental control issues need to be re-designed and interfaced with a new wheelchair that will be built by Advanced Medical, including, but not limited to: a height-adjustable arm sling (current sling is poorly designed; only adjustable 1”, spring oscillates during eating, and there is a significant moment arm on the sling support rod that additionally contributes to the instability of the device); cushion re-design (e.g., Roho – dynamically adjustable air cells for pressure relief (to prevent decubitus ulcers) and support/correct any lateral or posterior/anterior seating issues); and re-design of a number of poorly designed wheelchair brackets that are literally (and very painfully) digging into Maria’s skin throughout the day. Maria is frustrated with the lack of independence she has at work and home due to the current wheelchair design. Additional aspects of the project would include adaptive computer access via switch input (e.g., blink, eyebrow, etc.) and integration of that human-machine interface with the electrical system of the power wheelchair for driving (navigating wheelchair) environmental control (lights, telephone, etc.). The existing attachable laptop tray would also be redesigned as the current one is unstable and in general, poorly designed and non-functional.

Publications: None yet.
Biography: I am currently a Senior at Wright State University studying Biomedical Engineering. I am originally from Cleveland, Ohio, and attended St. Peter Chanel High School. Besides focusing on my major work I also hold leadership roles at my university. Currently, I am the Academics Chair for my university’s chapter of NSBE (National Society of Black Engineers). I have shown continued leadership by being a mentor, volunteering, and being a resident assistant at my university.

Abstract: The use of (DTI) Diffusion Tensor Imaging will be used for the quantification and analysis of neuroimaging data. The data is obtained from 30 participants: 15 patients, who were exposed to General Anesthetics during the early infancy stages of life, and 15 controls. The exposure is assumed to cause white matter structural changes in the developing brain. The significance was to see if there are any volumetric differences between patients and controls at the two regions of interest (ROI): the corpus callosum and the cerebellum.

DTI is the specialized form of Magnetic Resonance Imaging (MRI) that allows the user to view changes in white matter tract fibers. ROIs were quantified using Diffusion ToolKit and TrackVis (http://trackvis.org/). Raw DTI data were input into Diffusion Toolkit and tractography data were created and displayed with TrackVis, where ROIs were segmented manually.

Publications:
Isiah A. Kendall

Status: Senior, Biomedical Engineering
Research Topic: Evaluation of G Forces in Helmet Collision and Concussion Risk
Advisor(s): Tarun Goswami, D.Sc.

Biography: I am a Senior Ohio Space Grant Recipient for the 2012-2013 school year. My hometown is Columbus Ohio. I am currently a Senior at Wright State University pursuing my Bachelor of Science Degree in Biomedical Engineering. Choosing this major is something I have dreamed about ever since I was very young. Throughout my life I have had many injuries including broken bones and severing my finger. Luckily I was able to recover with no problems, but I know others may have not been as lucky. From that moment on in my life I decided that I wanted to devote my time to helping others in need of mechanical prosthetics and other machine driven devices. All through my academic years I have not only learned about the anatomy and physiology of the body, but also the skills required to make biomechanical improvements. All of which have driven me to pursue my dream even more.

I am currently Vice President of the National Society of Black Engineers at my school (NSBE) and the President of Totally Addicted to Christ Ministries (TA2C). Aside from school, I enjoy reading, writing and playing instruments. I have been playing guitar for 4 years and hope to continue playing for the rest of my life.

Upon completing my degree at Wright State University, I plan on attending graduate school in Biomedical Engineering. I would like to focus my studies in the Biomechanics/Biomaterials field in hope of using my creative abilities to aid the less fortunate.

Abstract: In contact sports, when two players run towards each other from opposite directions and collide, at the point of collision the momentums transfer. A force develops through the skin of the helmet, liner, and skull to the brain that may be coup and countercoup in nature. This process evokes a certain amount of g-force on the skull that is transferred to the brain, causing it to rotate and may lead to a rotational concussion. The objective of this research is to understand the collision events via helmet to the brain using the data from the literature such as measurements by the National Football League. Analysis was conducted to determine g-forces developed and transferred from the helmet to the brain in professional athletes. Monte Carlo simulations were used and data was fitted with normal and Weibull distributions for a specific risk of injury when a specific g-force was generated. Accordingly, a 10%, 50% and 90% risk level was assigned and mathematical equations developed to predict such risks. Concussion collision risk in children 10-15 years of age and 15 and older were also analyzed. Although concussion risk while wearing a football helmet is little understood, this research examines one type of helmet and padding. The forces resulting in 10, 50 and 90% risks for concussion were 1125.56N, 2073.04N, and 2627.17N. For rotational concussion the angular accelerations for same risks were: 5952.38rad/s², 7619.05rad/s² and 8333.33rad/s².

Publications:
Biography: I am currently in my Junior year at Wright State University – Lake Campus pursuing a Bachelor of Science in Mechanical Engineering. I graduated high school from Marion Local High School in Maria Stein, Ohio. Throughout high school I always excelled in mathematics and science, which contributed to my decision of majoring in Mechanical Engineering. During my junior year of high school, I was selected to receive the Honda-OSU Partnership Math Medal Award and be a part of the JETS (Junior Engineering Technical Society) Team.

Currently, I am active in two organizations. I was recently inducted into Tau Beta Pi, a national engineering honor society. I am also a member and the Activity Coordinator of the Engineering Club at the Lake Campus. I have also had the opportunity of receiving a co-op at a local company, Coldwater Machine Company. This has helped me obtain valuable real world experience.

Abstract: The objective of this study is to determine the effects of crop-dusting, in particular, how long chemicals linger in the air causing pollution. Two unmanned aircraft will be flown around a vacant field and collect data. The wingspan of the aircraft will be approximately eight feet. For safety reasons, it is important that the field is vacant and there are not any obstructions that could obscure the data in the research project. The first aircraft will perform the crop-dusting while the second aircraft will perform the data collection. Some of the data that will be collected includes altitude, temperature, humidity, location, velocity, and air quality. The aircraft will also have the capability to collect video and photographs of the test flight. All this data will be analyzed to determine what affects the time interval the chemicals linger. It is believed the chemical dispersal will occur for an extended period of time at low levels.

Publications: None yet.
George D. Kubas

**Status:** Senior, Chemical Engineering  
**Research Topic:** The Morphing Properties of a Shape Memory Composite  
**Advisor(s):** Dr. Pedro Cortes

**Biography:** I am currently a Chemical Engineering student studying for my undergraduate degree at Youngstown State University (YSU). As an incoming freshman at YSU, I was awarded the Leslie H. Cochran Scholarship. This scholarship provided for all of my undergraduate schooling, and I am also a member of the University Honors Program. In my junior year, I began research on training procedures for shape memory alloys and the creation of shape memory composites under the guidance of Dr. Pedro Cortes. This research has led to the creation of a shape memory hybrid composite consisting of micro vascular shape memory alloys embedded in a shape memory polymer coated with aluminum sheeting. I hope to pursue this research even further in my graduate studies at Youngstown State University after my graduation in May, 2013. I am a member of Alpha Lambda Delta Honor Society, Pi Mu Epsilon Mathematics Honor Society, and Tau Beta Pi Engineering Honor Society.

**Abstract:** This research work has investigated the morphing characteristics of a shape memory composite (SMC) activated by high temperature shape memory alloy (SMA) tubes. Initial attention focused on the training of the SMA tubing. This testing produced optimal conditions for the tubes’ training. The focus of the research then moved to manufacturing the smart SMC-SMA system in which holes were drilled through the shape memory polymer (SMP) and the two way trained alloy tubes were inserted. Further research into the SMP generated conditions under which the polymer could be molded with the SMA embedded so as to forgo the drilling. Following the composite-alloy assembling process, tests were conducted so as to ascertain whether the smart system would work cohesively. Here, the SMA tubes were activated using hot air, and a morphing system was achieved by changing the thermal stimulus on the composite-alloy system. Initial results, have suggested that the SMC system is able to achieve up to 10 degrees of bending deformation. The present study has also impulsed the development of shape memory hybrid composites; here, the SMC-SMA plies were embedded between two aluminum alloy skin layers. Results show that the composite-alloy system successfully induces a structural change in the hybrid composite.

**Publications:**
Status: Junior, Mechanical Engineering
Research Topic: Material Characterization of Thin Layer Nano Films
Advisor(s): Hazel Marie, Ph.D., P.E.

Biography: I began my college career at Butler County Community College where I went to school and landscaped part-time. On the recommendation of a good friend I looked into Youngstown State University (YSU) and determined that their mechanical engineering program had all the components I was looking for. Upon transferring I moved from Butler, Pennsylvania, where I grew up and purchased a home on the south side of Youngstown, Ohio. The idea for the research I am conducting came from a sophomore level materials engineering class in which an assignment was given to perform literary research on an emerging material. Myself and two others worked very hard and our project garnered attention from some of the professors at YSU who requested I perform additional research on the materials.

Abstract: Research performed on thin layer nano films has shown a variety of promise for the material with respect to optical and thermal transport properties. By obtaining basic material properties necessary for engineering use it is hopeful that these materials can move closer to becoming available for commercial and consumer use. The material comes in a variety of thicknesses and layers and is produced using a rolling extrusion process. The fact that the material in anisotropic as well as being very thin presents several obstacles to overcome. The main characteristics that the research aims to discover are stress vs. strain graphs for tension tests both parallel and perpendicular to the extrusion direction as well as coefficients for thermal expansion in both directions.

In addition to obtaining the aforementioned material properties it is to be determined if the material behavior is consistent and predictable throughout various locations. Samples will be taken from all locations on a sheet and compared to ensure that the results are repeatable.

Publications: None yet.
COMMUNITY COLLEGE SCHOLARS
Darren M. Conley

Status: Junior, Construction Management
Research Topic: Dimensional and Engineered Lumber in Construction

Advisor(s): Dean M. Bortz, M.A., CSI, CDT

Biography: I am a graduate of Meadowdale High School in Dayton, Ohio. I graduated from Iowa State University in Ames, Iowa, with a Bachelor of Science Degree in Community and Regional Planning.

My interest in construction and design increased while earning my Bachelor's Degree. I began learning different construction trades and eventually started my own home remodeling repair business.

I soon became interested in learning the management side of construction which led me to Columbus State Community College and earning my Associate's Degree in Construction Management.

Abstract: I plan to review the impact of dimensional and engineered lumber on the construction industry. I will investigate these impacts by looking at types, applications, strengths, installation techniques, and costs associated with each product.

Using this information, I will determine which product is more attractive to the construction industry.

Publications: None yet.
Sharon L. Waldie

Status: Sophomore, Construction Management

Research Topic: Green Roof Performance

Advisor(s): Dean Bortz, M.A., CSI, CDT

Biography: I am originally from Delaware, Ohio, graduated Buckeye Valley High School, and have attended Marion Technical College and Columbus State Community College. In my studies I would like to focus on specifications, safety, and renewable, sustainable building materials and methods. My interest in Construction Management began with a vision of what could be accomplished while on a mission trip to Benin, Africa, in 2005. With goals set before me to make a difference in the community where I currently live, I would like to leave behind a functioning model of what I hope to accomplish in Benin in the future. My focus is stability of community within the area of homelessness, safe drinking water, and adequate sanitation. Additionally, I hope to address other areas in Benin, such as housing in group homes for orphans, and leadership training for high school students coming into the work force. Other projects dear to my heart include speaking publicly against human trafficking, I have shared my daughter’s story of how she died, abortion recovery for women in need of healing after receiving abortions, recovery from drug usage and traumatic brain injury.

Abstract: The objective of this project is to examine the green roof: looking at both new build and retro fitting an older building. Options available in materials and methods will be viewed with an eye toward what possibilities the future may hold. A physical sample will be demonstrated to show the substructures of the green roof build, as well as a review of some of the current green roofs within our region.

Publications: None yet.
Joshua D. Compaleo

Status: Sophomore, Engineering Physics

Research Topic: A Further Look into the Theory of Dark Matter

Advisor(s): Lori Cutright, Doug Hutchison

Biography: I am currently a Sophomore at Sinclair in Dayton, Ohio, and will be graduating with an Associate of Applied Science in Engineering in Spring 2013. Afterwards I will be transferring to Wright State University as an Electrical Engineering major. Originally a Business major, I became infatuated with Astronomy and in particular Mathematics while completing my general education requirements and decided that my life wouldn’t be quite as fulfilling if I didn’t change my major. Seeing Electrical Engineering as the perfect balance between the practical and the theoretical, it was the direction I decided to steer towards. I have yet to take many higher level engineering classes because my first two years have been centered on Math, Physics, and other general education courses. This is why I decided to pursue a project in Astronomy.

Abstract: Dark matter was first theorized in the 1930s to account for “missing mass” in the orbital velocities of galaxies and clusters. A competing theory, Modified Newtonian Dynamics, or MOND, accounts for the same phenomena through modification of Newton’s laws of motion. In light of an article I recently read on the NASA site as well as other articles I have read on the topic I would like to further explore both theories. While not in a position to do my own research, I plan on doing a survey of both theories to see how each accounts for the evidence obtained.

Publications: None yet.
Biography:  Currently, a student of Sinclair Community College, graduating in May 2013. Educated in both rural and urban areas of the eastern United States. Married in June, 2012. Co-Founder of Trivone (est.1991) and Royal Knight of Trivone. I am now looking forward to leading the nation into a more socially healthy and technologically advanced future.

Abstract:  Radiation permeates space and is an inescapable part of our universe. Most Earth based life cannot survive outside of Earth’s protective bubble, which makes radiation protection a must for human kind’s future.

The project has three main goals to look at how electrostatic fields can help achieve such protection. The first is researching the theory and experimentation of fields which deflect charged radiation and how it can be applied to the protection of humans and equipment in space. Second is a live experiment designed and performed with guidance from an academic mentor, in order to gain hands on experience with scientific methods and to support the underlying concept that charged particles moving through an electrostatic field experience forces that alter their motion. The third part, if time allows, is to research ways to make use of the radiation rather than just deflect it.

The conservation laws of physics have always inspired me to look into ways of making the most out of everything. Defending against radiation is a wonderful thing, but since it is there, why not make some use of it if at all possible? It is a matter of efficiency as well as avoiding waste.

Publications:  None yet.
Biography: Currently, I am enrolled in the Aviation Technology Program at Sinclair Community College. Throughout my academic studies I have been able to maintain a full course load, and continually make the Dean’s list. My cumulative GPA is 3.7. Along with my Associate of Applied Science Degree in Aviation Technology, I am also currently studying for a technical certificate as an FAA, Certified Aircraft Dispatcher.

I was blessed to be a part of a healthy family who owned and operated a small agribusiness. Being raised in this environment, I acquired many team building skills, learned how to operate various types of equipment, and gained experience in getting the job done in diverse work environments. Through my college studies I have learned many valuable leadership and communications skills which enable me to be at ease while giving a demonstration or speaking in front of a group. As a creative individual, I was able to demonstrate my problem solving skills through the many seasonal and part time jobs I held before and during my college studies. Recently, I completed a one-week unpaid internship at Maximum Flight Advantages as part of my Aircraft Dispatcher certification program. Additionally, through my Sinclair studies, I have completed the National Business Aviation Association’s L I and L II leadership certification.

Abstract: The need for accurate, dependable instruments in aircraft that enable the pilot to easily determine the position of the plane at all times, is vital for the safety of the passengers and crew as well as the aircraft itself. A leading cause of aviation accidents is spatial disorientation, which can occur when pilots receive conflicting or misleading information from their instruments, primarily the attitude indicator. The outside-in attitude display, which includes a moving-aircraft, versus the inside-out display, dates back to the early days of flying, and is the primary instrument of flight. A significant amount of laboratory and in-flight studies have evaluated the outside-in format over the years and have found it to be superior at preventing roll-reversal errors during normal flying and in recovering from unusual attitudes. Although outside-in attitude displays have been, and continue to be, flown throughout the world, and even though the majority of displays used continue to be inside-out, research and accident findings have shown that outside-in displays are the better instrument.

Publications: None yet.
EDUCATION

SCHOLARS
Elisa A. Cherry

Status: Junior, Adolescent to Young Adult Education (AYA), Mathematics

Project Title: Ellipses and Space

Advisor(s): Dr. Robert Chasnov

Biography: Elisa Cherry grew up in New Lenox, Illinois, and is the oldest of four children. She is currently studying Mathematics Education at Cedarville University, where she also participates in the Cedarville Cross Country team and is involved in her church. Upon graduation, she plans to teach high school math.

Abstract: My plan is to develop a series of lessons for Algebra 2 students using planetary orbits as a practical application of ellipses. I would like to create a lesson that explains or reviews the mathematical concepts of ellipses. I will then create a slideshow of various planetary orbits in our solar system and have students see how we can use this lesson with respect to this real life example. The main focus of my lesson, however, will be on learning how to practically apply material that the students are already familiar with. I plan to simply review the concept of ellipses with the assumption that I am teaching to students who are familiar with these concepts, in order to have more time to spend on the practical application aspect of my lesson. That being said, it will serve as a great review for the students whether or not they are interested in how it applies to space.

When I am a teacher, this will be a great way to incorporate practical application into a topic that students might not otherwise be able to make personal connections to. Apart from the lesson, I will create a worksheet to assess students’ understanding of the material, and give them an opportunity to investigate this topic further as a supplemental homework assignment. I want to make this assignment somewhat open-ended so that students who are genuinely interested in learning about outer space will have the freedom and creativity to develop this interest in a way that appeals to them. As a result of my lesson, students will be able to practice drawing ellipses in a way that incorporates eccentricity, major and minor radii, vertices, and foci. Additionally, students will practice the ability to represent an ellipse using equations, as well as draw an ellipse based on a given equation. This will be a chance for me to not only personally learn more about NASA and space, but to also begin developing material that I will one day be able to incorporate into my lesson plans in order to help my students connect to the material on a personal level and take an interest in how mathematics can be used in the real world.

My project will include research about how ellipses applies to objects in space, a slideshow that can be used to present this lesson when I am actually a teacher, worksheets to assess the students’ abilities to perform the desired skills, and a poster for the upcoming conference that will display the overall idea of my project.

Publications: None yet.
STATUS: Junior, Middle Childhood Education, Science and Mathematics

PROJECT TITLE: Principles of Flight

ADVISOR(S): Dr. William Jones and Dr. Robert Chasnov

BIOGRAPHY: I am a Junior at Cedarville University, and my goals after graduating are to teach Middle School Math in a public school setting, as well as train teachers in third world countries, particularly Malawi, Africa. I was born in Springfield, Ohio, and I graduated from Shawnee High School in 2010. I love to hunt, fish and play sports. I also love helicopters. In fifth grade I had the ability to receive helicopter lessons and ever since that day, I have loved the concept of flight, which is the reason for choosing the topic of flight for my project.

ABSTRACT: This project will consist of two separate parts that will introduce students to the principles of flight. The first part will be a class discussion on the history of flight, specifically the Wright Brothers, and how they used a three axes control system to maneuver the plane. This will lead into discussion on ailerons, rudders and elevators and their functions on a modern day jet. We will discuss Bernoulli’s principle and test the three axes control system by creating paper airplanes and placing the ailerons at different angles to see how it affects the flight of the plane. The students will have to use the knowledge they have learned to make hypotheses on how they think the plane will fly based on the position of the ailerons.

PUBLICATIONS: None yet.
LaKeyia S. Gollman

Status: Senior, Middle Childhood Education, Science and Mathematics

Project Title: Forces in Motion

Advisor(s): Dr. R. Swami

Biography: I am a native of Detroit, Michigan. I attended Cass Technical High School where my concentration was communication. While taking our core classes, I became more interested in my math classes than my specialty classes such as speech or debate. My math classes challenge me to think. Every day I would anticipate going to math class; I knew I would learn something new. I discovered many formulas on my own. As a child, I always knew I wanted to become an educator; however, I didn’t know what subject. Upon graduating I was certain that I would major in education with a concentration in mathematics. I am currently a senior at Central State University (CSU), located in Wilberforce, Ohio. Throughout my matriculation at CSU I had an internship every summer. My freshman year I worked at the Internal Revenue Service in telecommunications. My sophomore year and junior year, I worked with Upward Bound during the residential summer component in Delaware, Ohio, and Farmington, Maine. I mentored students and taught various math classes to prepare students for success for the upcoming school year. The joy of my day did not come from “floating the river”, visiting islands, or traveling through the mountains; what made my summer worthwhile were the students’ gracious emotions after mentoring or helping them discover new concepts in our math class. If I needed any reassurance about my future career, my internships brought me just that. Upon graduating, I plan to teach middle school math and science and later pursue my Master’s Degree in Educational Leadership. My lifelong goals are to help reconstruct the STEM curriculum in K-12 schools and establish a franchise of youth centers for struggling teens.

Abstract: As the world continues to advance with technology so does our learners. Students are less engaged with tradition instruction. As educators, we must accommodate our 21st century learners. My education project is teaching the relationship between free fall and atmospheric pressure through inquiry based learning. Students will discover gravity in motion by completing a guided lab to assist them with their exploration for general understanding of gravity and air resistance. Upon discovery, students will create their own lab. This will allow students to be “the scientist”. They will need to ask theoretical questions, make observations, develop hypotheses, draw conclusions, make inferences, formulate new questions and relate it all to their prior knowledge. Students will be able to communicate and justify their proposed answer. My role is to facilitate by leading students in the right direction, to engage and motivate students, assess prior knowledge and preconceptions, and clarify through discussion. Next generation assessments will be used to assess this lesson.

Publications: None yet.
Biography: My name is Douglas Richards. I am a Senior at Central State University where I am majoring in Middle Childhood Education mathematics and science. I transferred to Central State from Sinclair Community College where I received an Associate’s Degree in Liberal Arts and Sciences with honors. At Sinclair, I became a member of Phi Theta Kappa. This year, I was hired as a teacher’s assistant for Trigonometry. As a teacher’s assistant, I am responsible for tutoring and teaching a supplemental instruction class. I was also involved in the Science Education Conference of Ohio’s conference that took place in Dayton on February, 7th and 8th 2013. At this conference, I gave a poster presentation of an inquiry science lesson on matter. I aspire to teach seventh or eighth grade mathematics or science in an urban school district.

Abstract: My lesson will be an inquiry based lesson involving both mathematics and science using content that aligns with the middle school standards in Ohio. I will be using NASA material to produce a lab exercise and a lesson plan.

Publications: None yet.
Biography:  My name is Kaihla Smith, and I am a Junior studying to be a teacher at Kent State University in the Early Childhood Education Program. Some background information is that I am from Geneva, Ohio, and graduated from Jefferson High school as an honor student in 2010. I have experience with children from 6 years of babysitting and volunteering at Streetsboro Elementary in one of the second grade classrooms. I originally wanted to be a Pediatrician, but realized from my volunteer experience that the classroom was the right setting for me. Some things that are important to me are spending time with family and friends, volunteering, helping others, and trying my best to succeed.

I am going into the specific career of Early Education because I believe the most crucial times for learning is birth until age nine. I would like to strive to be the best teacher possible and help my students learn in a warm loving setting. I will provide my students with many opportunities for exploring hands on and through student based discovery. By providing efficient fun activities to learn will help the child retain information more efficiently overtime to use throughout their lives.

Overall, I am honored to be able to participate in the Space Grant Consortium Scholarship. I believe this opportunity will let me explore all that the NASA program has to offer and can then share my experience with my future students. While growing up in school I did not know much about what the NASA program did, besides being an astronaut. However, through my own interest I learned that the NASA program has many future job opportunities my students might consider as their future careers. Also, my students will benefit from a positive and proficient experience in mathematics and science that I will provide as a teacher. Being skilled at math and science not only helps my students in high school and college, but also provides a better chance that my students will want to pursue a career in math or science. Perhaps even one day working at NASA and helping in the race to keep America up to date with technological advances.

Abstract:
Activity/Exploration: Read a new book to the children and also create a science exploration based on the book. This is considered a read and create lesson.

Date of Lesson Plan:  March 3, 2013

Subject Areas:  Language Arts and Science

Topic of Study: Reading a book about space and creating a rocket that blasts off just like the rocket ship in the story. A dramatic play space area will also be created weeks later.

Continued on the Next Page . . .
Abstract: (Continued)
Objectives/Learning Goals:
• To share in a whole group reading with the children.
• To build classroom community.
• To deepen children understand of how texts work. (Reading right to left, how the text is written, who illustrates and writes the book, meaning of the book, sequence of the events that take place and the characters in the book.)
• To develop children’s vocabulary and pronunciation skills. (Pointing to the text will be beneficial).
• To develop appropriate read-aloud behaviors. (Sit and listen to the story and comment and ask questions when asked).
• To connect the story with real-life applications.
• To understand more about space and what astronauts do.
• Learning math concepts (counting down 5…4…3…2…1 Lift off!)
• Learn and performing a science experiment to show how a rocker works (simplistic view of Newton’s Third Law of Motion.)
• Understand the nature and development of scientific knowledge.
• Participate productively in scientific practices and discourse.
• Use imagination to create our own space ship for the classroom and discuss overtime how we can do this as a class.

Standards/Strands:
Expressive Language:
Speak audibly and express thoughts, feelings and ideas clearly. (Articulation)
Reading and Comprehension:
• Ask and answer questions, and comment about characters and major events in familiar stories.
• Use pictures to describe and predict stories and information in books.
• Demonstrate an understanding of the meaning of stories and information in books.

Reading:
Show an appreciation for reading books and telling stories.

Social Communication:
With modeling and support follow typical patterns when communicating with others (e.g., listens to others, takes turns talking and speaks about the topic or text being discussed).

Mathematics: Counting and Cardinality: (both in book and video liftoff)
Know number names and the count sequence.

The Physical Setting:
• The universe
• The Earth

Science and Technology:
Explain that to construct something requires planning, communication, problem solving and tools.
Scientific Inquiry:
Design and conduct a simple investigation to explore a question.

Gather and communicate information from careful observations and simple investigation through a variety of methods.
Scientific Ways of Knowing:
• Recognize that there are different ways to carry out scientific investigations.
• Realize that investigations can be repeated under the same conditions with similar results and may have different explanations.
Forces and Motions:
Investigate ways to change how something is moving (e.g., push, pull).
Understanding Technology: (Used for the dramatic area space rocket)
Explore that some materials can be used over and over again (e.g., plastic or glass containers, cardboard boxes and tubes).
Scientific Inquiry:
Explore and pursue student-generated "what happens when" questions.
Use appropriate safety procedures when completing scientific investigations.
Work in a small group to complete an investigation and then share findings with others.
Create individual conclusions about group findings.
Use appropriate tools and simple equipment/instruments to safely gather scientific data (e.g., magnifiers, timers and simple balances and other appropriate tools)
Social Studies: Citizenship Rights and Responsibilities:
Describe the results of cooperation in group settings and demonstrate the necessary skills.
Social Studies Skills and Methods:
Obtain information from oral, visual, print and electronic sources.
Communicate information orally, visually or in writing.
Identify a problem and work in groups to solve it.
Groupings of Children: I will be presenting the book to the whole class. I will be breaking the group into three groups (roughly 6 in each group equaling 18 children) to work on the science experiment (balloon rocket ship). Later in the semester I will be working on creating a dramatic play area in which all students will be involved in the details and planning.

Needed Materials:
Book:
- Zoom, Rocket, Zoom! By Margaret Mayo and illustrated by Alex Ayliffe
- Show: videotape of rocket lift off: Link: http://www.youtube.com/watch?v=9rrWBZYLaXU

Balloon Rockets:
- Plastic straws
- Clear cellophane tape
- 6-8 meters of nylon monofilament fishing line.
- Scissors
- 1 spring clothespin
- 1 rocket drawing to place on the balloons to remind children that we are creating a rocket ship.
- Stopwatch
- Camera
- Pen and paper to jot down notes from the experiment.
- Proper Environment: Place where we can perform this experiment.

(Later on) Dramatic Play Idea:
- Large Paper and black marker (to write with for children’s ideas how to build the spaceship).
- Boxes, containers, and other found materials to build.
- Duck tape
- Paint/markets/stickers to decorate when completed
- Pictures of spaceships, planets, astronauts…etc.
- Space in the classroom for our large rocket we create.
Procedures/Process: First get out the book to read to the class, next have materials prepared to create simple rocket ships out of balloons. Finally, later on in the next few weeks prepare material to produce our own rocker ship as a dramatic play area.

Preparation Plans and Provocations (Questions to ask the children):
For this exploration I will first need to prepare the environment by inviting (Ms. Baldwin) children to the rainbow rug to listen to a new book.

Questions from the Book:
Turn to the cover: What do you think this book is going to be about?
Ask children to count down with me based on text from the book: 5…4…3…2…1… LIFT OFF!
What are the astronauts doing in this picture? (Astronauts are in the control center and are flying the spaceship).
Comment: The Lunar module on this page looks like it is a small version of the spaceship so they can easily move around on the moon.
What does the moon buggy look like? (It almost looks like a car that is made to travel on the moon)
How are these people floating in the air? Can we float in the air on Earth? (Talk a little about gravity difference between the Earth and the moon).
It says that space satellites take pictures; what do you think they take pictures of?
End: I wonder how a rocket ship flies into space. Does anyone have any ideas?
Mention: We are going to break into two groups (the green and yellow group) the do a science experiment. What do you think we will do a science experiment on? (How a rocket ship flies).

Balloon Rocket Ship Lesson:
Take children into a separate room to do our read and create activity.
First have students sit on the floor and tell them we are going to watch a video on an actual space launch.
Ask them from the video: Did you notice how the rocket was moving? How was it moving? What direction was it moving (upward)?
Write their ideas on a large piece of paper.
Tell students we are going to be creating our own rockets using balloons, fishing line, straws, tape, a clothespin, and stop watches.
I will explain that we are going to place the straw inside of the fishing line and I am going to blow up a balloon and see how what happens when we tape the balloon to the straw.
I will ask children what they think will happen when I let the balloon go? (Get ideas).
I will go through the experiment once to show them the process. Get the reaction when I let the balloon go. How did the balloon get to the other side!?
Okay we are going to try it again and this time I will need everyone’s help. I will need a friend to help me hold the fishing line, I will need a friend to place the straw around the fishing line, someone to tape the straw to the balloon, someone to help me let go of the balloon, and someone to stand at the end and see how many seconds it took for the balloon to travel to the bottom (have a teacher at the end to help with stopwatch). I then need a friend to tell me what happened and how fast the balloon went and help me write it on the large piece of paper.
I would like to continue this experiment by changing the variables: For the first one I would like to ask what the children think will happen when we make the balloon smaller (will it travel faster, the same, or slower?)
I would then like to change the angle of the fishing line (we are going to start with the fishing line being straight). I would like to ask what will happen if we lift the fishing line so it’s at a different angle. What will happen (get ideas).
Write all ideas and how each experiment went with each group. After all groups are done we will come back and compare our results. I will explain that some groups have different times that the balloon traveled and that each group was somewhat different. I will ask: why do you think the times turned out differently?

- The main goal from this lesson I would like to accomplish is to have children help with the experiment and realize that the balloon moves for a reason (pressure from the air trapped in the balloon) and that it is not just something magical that is taking place.
**Dramatic Play Transition: Second Part:** Done over the course of the semester.

- I will be incorporating space in many aspects of the classroom throughout the semester. I plan to read another book called Astronaut Handbook by Meghan McCarthy and incorporate our very own space shuttle in the classroom. We will be talking as a class how we could build our very own rocket to keep in the classroom.

I will ask questions such as:

- What materials could we use to make the rocket ship?
- How would the rocket look?
- What would we name our rocket ship?
- What would our flag look like? Can we make our own flag to stand next to the rocket ship?
- How do space ships fly?
- What does the inside of a spaceship look like?
- What do astronauts look like? (Such as their clothing: Helmets, gloves, boots, suits)
- What materials do astronauts use in space? (Such as storage for things they find such as moon rocks, telescopes/magnifying glasses to look closer at objects.)
- What planet do we want to travel to? (For example, if we chose Mars we would place out moon rocks and place our spaceship on white fabric because Mars is white in color.)
- What do astronauts eat in space? To get ideas I will show them pictures of freeze dried food. I also bought freeze dried ice-cream for the students to try as a tasting experience.
- How do they go to the bathroom, where do they sleep, how do they get exercise, how long do they stay in space, why is there no gravity in space (discuss what gravity is and show pictures of people in the space cockpit floating.)

- We will then be creating our spaceship out of found materials such as cardboard boxes, old containers or anything else we can find. We will also create things that spacemen use that we talked about such as helmets, boots, and suits out of these found materials.
- Along the way for extra guidance I have printed off pictures of all the material we will be talking about and using such as pictures of real astronauts, planets, and spaceships. The word of the object is also typed next to each picture so children can relate picture to text.
- Finally, we will explore with our dramatic play area about space and create our own Astronaut Handbook and students can write or draw pictures (based on children's skill level) what they would take to space and what space looks like to them, or how they would look if they were an astronaut.

**Documentation/Assessment Plans:** I plan to have one of my team members’ track my lesson plans by taking pictures. In these pictures afterwards I (and the rest of the team) will be able to look back at the pictures and see how the children are reacting to the book and science experiment. Also, these pictures will help me in documenting and reflecting on the lesson. I will also take notes afterwards on what the children said and how they reacted to the book for my personal reflection after sharing the book.

**Notes/Reflections:** Reflecting is an important part of being a successful teacher because no matter how much planning an effort is done for a lesson plan it may be unsuccessful or not go as planned. However, we must not give up in the lesson because it can be alter and revised to try next time until it eventually will become perfect. Children are unpredictable and all children respond differently to lesson plans so it is crucial to be able to reflect on the good and bad of all my future lesson plans as a teacher.

**Publications:** None yet.
Caroline I. Miller

Status: Junior, Early Childhood Education

Project Title: The Moon and Me

Advisor(s): Dr. Ann Mackenzie

Biography: My name is Caroline Miller, and I am currently a Junior attending Miami University studying early childhood education. I am also working towards a thematic sequence in special education, as well as planning to get certified to teach fourth and fifth grade.

I am actively involved on campus being part of Miami University’s Ambassadors for Children, holding the position of leadership chair in the sorority Alpha Delta Pi, participating in Adopt-a-school, and being a member of the honors educational Fraternity Kappa Delta Pi. I also participate in the National Science Teacher Association on campus. Miami University has given me many opportunities to gain knowledge and experience with early childhood education. Since my freshman year I have had opportunities to work in classrooms, gaining valuable experience. Working as a student tutor at Miami’s Rinella Center, teaching Sunday School at my local church, as well as working as a camp counselor during my summers have only confirmed my passion of teaching. After graduating college I hope to pursue a career in education and inspire children to enjoy learning while encouraging them to be their best.

Abstract: As a teacher, I believe it is particularly important to instill the interest and exploration of science in children. I would want to focus on teaching science and space in the lower elementary grades. According to the new Ohio science content standards, during kindergarten, children are supposed to be able to explain that the moon, sun and stars can be observed at different times of the day or night.

My plan is to explore the use of technology with students, but for a younger age group. My plan is to create a lesson where students can observe the moon, sun, and star patterns with technology that will be user friendly for them. Students today are becoming more and more technologically savvy, so it essential for teachers to keep up with what technology is new and effective in the classroom. The research I will do is to trigger my students’ background knowledge through using many of NASA’s resources on their websites about the changes that take place in the sky. The NASA eClips specifically designed for younger elementary grades, the image gallery, and the virtual exploration of the moon are just a few examples of the things we will be viewing on the NASA website.

From there I intend to have my students create their own inquiry questions about what they have observed from the websites, and videos. Using their own questions, I will have them investigate them by their own observations and documentation of the changes they notice through video and photography. In the end, I hope to create a classroom compilation of all of the observations to create a classroom book, and mini-documentary so that the students can look back and reflect on what they have observed over the unit. The video will consist of putting together all the photos and videos the children record using iMovie, and then having each child come up with some sentences describing what they observed to voice over their section in the movie. They can then use this mini-video and book during the rest of the unit. This would not only use NASA’s great resources, but also children learning through inquiry while using digital technology to show what they have learned.

Publications:
Kerry E. DuLaney

**Status:** Senior, Adolescent to Young Adult Education (AYA), Mathematics

**Project Title:** Applications of Integration: Orion Crew Module

**Advisor(s):** Dr. Sandra Schroeder

---

**Biography:** They call me Kerry DuLaney. In 2011, I graduated with highest honors from Edison Community College with my Associate of Applied Science and subsequently transferred to Ohio Northern University. I am currently a transfer Senior at Ohio Northern University studying Mathematics with a concentration in Secondary Education. At Ohio Northern University, I serve as an active officer in Kappa Mu Epsilon, the math honor society, and Mathematical Association of America (MAA). My goal when I graduate from Ohio Northern University is to become a high school math teacher. I hope that I can bring an understanding of math to my future students and, just maybe, interest some of them to pursue careers in mathematics.

I see being able to utilize the vast educational resources provided by NASA within my classroom to increase student understanding of how to relate math to everyday life, and to enable students to acquire a better understanding of how many of today's careers revolve around math.

**Abstract:** Plans for my educational project revolve around the integration process used in Calculus. I will be using the “Next Generation Spacecraft” classroom activity to show a technical application of integration to find the volume of NASA’s newest spacecraft, the Orion Crew Module. This classroom activity will allow the students to incorporate math skills they have learned prior and combine them with the newly learned topic of integration. They will need to recall how to determine the equations of a line and circle, and to solve a system of simultaneous equations to set up the integrals to find the volume of the spacecraft.

**Publications:** None yet.

---

**Congressional District:** 4th

**Congressional Representative:** Jim Jordan
Biography: Thomas Steinberger is a Junior at Ohio Northern University (ONU). He is pursuing multiple degrees in Mathematics, Education, and Applied Physics. In addition, he is also following a course schedule to obtain an astronomy minor. In his time at ONU he has been a part of many on campus organizations. He has been on the Dean’s List every semester in his career, is currently the secretary for the ONU Astronomy Club, Vice President for the ONU Solve—a mathematics group aimed at engaging proposed journal proofs, participated in Track and Field for his freshman and sophomore years, and conducted several research opportunities with various professors in the Mathematics and Physics departments. He has taken part in tutoring his career at Ohio Northern University and enjoys helping students understand the misunderstood concepts of mathematics and physics. He has also made many presentations at several mathematics conventions including the 2013 Joint Mathematics Meeting in San Diego. His ultimate goal is to obtain his Ph.D. in Physics and conduct research at a university while being able to educate young adult minds.

Abstract: Many times teachers lack to connect their content area with the real world. I believe that this is an important factor in ensuring motivation and true understanding. In this lesson we will cover the concepts of rates and use many methods such as: student researching, collaboration, “pair and share”, and discussion. In the second part of the lesson we will discuss astronomical rates and the students will be given a project in which they play the role of mathematicians or scientists. In this project each student will get a letter from an important institute such as the U. S. Government that introduces a problem. A sample problem could be “An asteroid is approaching earth at-- --m/s. How long does the earth have until it reaches earth. . .” etc. Each group of students will have a different problem and they will have use the new knowledge of rates as well as previous knowledge to resolve the problem. At the closing of this project, each group will present to the class their problem and their calculations.

Publications:
Mentioned in November issue of College Mathematics Journal for solutions to problems.
The University of Toledo

Steven E. Solomon

Status: Senior, Adolescent to Young Adult Education (AYA), Science

Project Title: The Curvature of 3D Space: Is Our Universe Geometrically Closed, Open, or Flat?

Advisor(s): Ms. Libbey McKnight

Biography: I am from Canfield, Ohio, where I have an amazing family that is very supportive. The University of Toledo has been my home going on the last four years now. I have the opportunity to work in Ritter Planetarium here where I deal extensively with science education. Also, I have started my teacher observations at Wildwood Environmental Academy where I get the privilege of observing great teaching techniques. As a result, I have learned valuable skills that will help me during the rest of my academic and professional career. As an education major, I obviously want to teach and I have a huge passion for the profession. However, I would love to become a planetarium director and help increase public understanding of science. I would also love to work in higher education after receiving an educational doctorate one day. Another aspiration and alternative route is to perhaps become a high school principal and really improve certain areas of education. While I do have lofty goals, I am a realist and at the present moment I am locked in on teaching high school science. In particular, I would love to teach high school astronomy; especially if the school I teach at has a planetarium that I can use. Hopefully, this lesson plan that I write will be another great step forward in my journey.

Abstract: My lesson plan will teach high school students a concept brought about by recent research from the Wilkinson Microwave Anisotropy Probe (WMAP). The probe was launched in 2001 in an effort to understand more about our universe’s origin and how it will end. Students naturally wonder about these questions; and the pursuit to find these answers will bring back that exited five year old that is still inside every student. First, students will learn a little bit about WMAP and some of the big questions it was designed to address. Next, students will learn about the abstract concepts associated with universes that are curved different spatially. To do this, the lesson will use a NASA website contained in an online list of NASA teaching materials. The website contains useful explanations, pictures, and even videos. The lesson will get really interesting when students measure angular sizes using a microwave sky map from the website containing nine years of WMAP data. Based on these measurements, students will decide for themselves which geometric shape our universe actually is. Specifically, the students will be measuring temperature fluctuations and determine that their average overall angular size is one degree across. This finding confirms to a very high degree that we live in a geometrically flat universe. A class discussion at the end of the lesson will delve into the implications that their discovery has on determining what the fate of our universe is.

Publications: None yet.

Congressional District: 6th
Congressional Representative: Bill Johnson
**Paul T. Tran**

**Status:** Senior, Middle Childhood Education, Science and Mathematics  

**Project Title:** Earth’s Rotation and Orbit through Tracking Shadows  

**Advisor(s):** Dr. Susan Gregson

**Biography:** Paul Tran graduated from Wayne High School in Huber Heights, Ohio. He is currently a senior in the Middle Childhood Education program at the University of Cincinnati. He is seeking licensure in the content areas of mathematics and natural science as well as an endorsement in social studies. Paul will graduate in April with a Bachelor of Science in Education and a minor in Biological Sciences. He is currently student teaching seventh and eighth grade general science at Gilbert A. Dater High School, with his mentor teacher Mrs. Christmon, in the Cincinnati Public School District. In addition to being selected as an Ohio Space Grant Consortium Education Scholar, Paul is a recipient of the Choose Ohio First STEM scholarship and CIEE South Korea Scholarship Program. He is currently working with his college professor and mentor Dr. Gregson and colleagues on a research project titled Math Educators for Equity. Throughout the course of his undergraduate degree, he has been involved in BearcatBuddies, Future Educators of America, Middle Childhood Education Society, STEM Education Association, and Zoo-Mates. His future goals are to further his education and obtain certification in TESOL, Teaching English to Speakers of Other Languages, to help remove barriers in education in the areas of mathematics and science.

**Abstract:** Students tend to confuse the concepts of rotation and revolution when learning about earth and space science. The objectives of this lesson focus upon the sun’s apparent position to cast shadows and determine lengths and angles to relate it to different times of the day. To introduce the lesson, the class will discuss and explore how civilization from the past used shadow sticks and sun dials to distinguish time before the invention of clocks. They will construct their own models in order to accurately distinguish different times during the day. Students will analyze the effect of earth’s rotation and compare it to the rotation of the moon and other planets through models. Students will research further upon the topic of shadows to understand seasons and relate it to the length of shadows during different times of the year.

**Publications:** None yet.
Biography: My name is Kate Burkman. I am currently a Junior at the University of Dayton, double majoring in Biology and Adolescent to Young Adult Education in Life Sciences and Integrated Sciences. I am involved in a variety of activities on campus. Some of the activities I participate in are marching band, pep band, Alpha Phi Omega (a co-ed service fraternity), Epsilon Delta Upsilon (a co-ed education fraternity), club field hockey, astronomy club, and collegiate to adolescent young adult club.

Abstract: My lesson plan for the classroom would be focused on climate change and the planets. The students would hear a lecture about climate change and how it negatively affects Earth. Then the students would be posed with the scenario that if Earth was no longer able to sustain life, where could humans go? Students would receive a lecture on the moon and planets, but it would be brief and include mostly general information. The students would then be broken up into small groups; each group would be assigned a different planet or moon, and would have to do research on their assigned body. The students would need to research the biological composition of the planet, planet’s distance from sun, whether water is present, and other key factors that sustain life on earth: the students would also need to determine travel distance and what changes would need to be made to each body in order for life to be sustainable. After the research period is over, the students would present their findings and state why or why not their planet would make a good choice for colonization. The class would vote on which planet they feel would sustain life the best and the planet with the most votes moves on to the final stage of the lesson. The class as a whole would design a model of what the planet would like before and after the colonization was made. This lesson teaches students about planets, while connecting planets to problems seen in the world today. This would hopefully spur students to make changes in their lives to help make their lives “greener.”

Publications: None yet.
Erin M. Yacovoni

Status: Junior, Middle Childhood Education, Science and Mathematics

Project Title: Engineering a Better Environment

Advisor(s): Dr. Mary Kay Kelly

Biography: I am a Junior at the University of Dayton pursuing a degree in Middle Childhood mathematics and science education. While at the University of Dayton, I have enjoyed being an active member of many organizations. I participate in the Colligate Middle Level Association (CMLA), Theta Phi Alpha Fraternity, Big Brothers Big Sisters, and campus ministry. While being a member of these organizations, I have also served as president of CMLA, Executive Position for Theta Phi Alpha Fraternity, and Vice President for Big Brothers and Big Sisters. Along with being a member, I tutor weekly with Big Brothers and Big Sisters in an after school program. I am a physics lab teacher's assistant at the University and participated in the Engineering Innovation and Design for STEM Teachers summer program.

Abstract: Inspired by the featured website on NASA’s resources for educator’s grade 5-8, Planet Health Report, and the New Science Standards for Ohio, I decided to create a curriculum for fifth grade. Through using the engineer design process, students will investigate the current state of the environment and how this impacts the ecosystems. Students will engage in an inquiry-based curriculum that encourages students to think outside of the box and relate the lesson to real life application. Along with connecting how the environment can impact ecosystems, students will learn about possible STEM career fields they can pursue when older.

Publications: None yet.

Congressional District: 10th
Congressional Representative: Michael R. Turner
Maggie F. Demarse

**Status:** Junior, Middle Childhood Education, Science and Language Arts

**Project Title:** Destruction of Volcanoes

**Advisor(s):** Dr. Brian T. Boyd Ph.D.; Mr. Chris A. Murphy

**Biography:** I am a Senior at Wright State University pursing a degree in Middle Childhood Education and have obtained a minor in Biological Sciences. I was born in Dublin, Ohio, and in 2006 I moved to Miamisburg, Ohio. I graduated from Miamisburg High School in 2009 and was accepted to Wright State University. Upon acceptance I received the Wright State Scholar scholarship. As an aspiring teacher I plan to become an educator that can supply a diverse atmosphere for students that will enable them to achieve success in the future. Relationships that I have built thus far include working intimately with science educators at Wright State University in the instruction of teaching future science educators, as well as tutoring students in both primary and colligate levels through being a Study Coach for Tutoring Services at Wright State University and the Extended Day Program at the Miami Valley School. In addition to my academic endeavors I have worked for the Target Corporation since 2006. In my time there I have developed communication and leaderships skills which have enabled me to gain a management position through the company.

**Abstract:** My plan for an educational project is a lesson plan on the destructive properties of volcanoes. This lesson plan has goals of intriguing students, and getting them interested in the world around them. Looking at volcanoes will help students understand more about their planet and how the earth works. This lesson is creative and is meant to give students freedom academically. The research component will allow students to explore the web and let them guide their own learning through studying what they want to learn about volcanoes, while staying within the guidelines provided. The objective of the lesson is to lead students to learning the different types of volcanoes. They will need to identify the three types: Cinder Cone, Composite, and Shield as well as examples of the types they are studying (such as Mt. Vesuvius, Mt. St. Helens, etc.), and the impact those volcanoes have had on the environment. NASA materials have been incorporated through the research portion for the students, providing plentiful websites with an abundance of information on the properties of volcanoes and how their processes interact with our world. Not only have NASA materials been incorporated for the students to use but the lesson plan was derived from using NASA web materials as references.

**Publications:** None yet.

Congressional District: 10th

Congressional Representative: Michael R. Turner
Kathan M. Nagel Koeller

Status: Junior, Middle Childhood Education, Science and Social Studies

Project Title: Can We Grow Food on Mars?

Advisor(s): Dr. Diane Huelskamp

Biography: Jumping into the education field represents a change of careers for me. Prior to enrolling at Wright State University (WSU) Lake Campus, I was a web developer for a small firm in Northwestern Ohio. As I began to volunteer with local schools and nonprofit groups in my spare time I realized how much I enjoyed interacting with middle school aged children. I look forward to having the opportunity to encourage my own students to become confident, engaged learners who maintain a lifelong interest in Science.

Abstract: Globally we are faced with large environmental challenges. New technologies need to be developed in order to maximize our limited resources. By applying concepts developed through NASA research we can create solutions for Earth as well as space.

Food production in constricted environments presents a unique set of challenges which students can observe by construction their own mini-ecosystems using items readily available to them such as soda bottles, food containers and packaging supplies. During the course of our project students will be able to measure the progress of their ecosystems to analyze what resources are needed for plants to produce food effectively and how scientist could design technology to meet those needs. Each week of the experiment we will use the Educators section of the NASA.gov website to highlight NASA articles related to growing food away from Earth. Students will have time during class forums to discuss the articles and then write about their own thoughts on the technologies used.

Publications: None yet.
Josiah M. Banks

**Status:**  Senior, Adolescent to Young Adult (AYA) Education, Integ. Math

**Project Title:**  Newton’s Three Laws of Motion

**Advisor(s):**  Karen Henning

**Biography:**  I graduated with a 4.0 GPA from Campbell Memorial High School in Campbell, Ohio, and was the Salutatorian of my class. Presently, I am a Sophomore at Youngstown State University in the field of Integrated Math Education. Some of the groups that I am currently a member in include: Youngstown Student Education Association, Ohio Student Education Association, National Society of Collegiate Scholars, Biology Club, and Pi Mu Epsilon. My interest to become an educator was heightened by my inspirational high school Calculus teacher and friend, Michael Soroka. I grew up in a low-income family so the importance school was never really stressed. Although, I went through many struggles, I decided I wanted a better life. I pushed through, and was the first person in my family to graduate high school and go to college. I plan to keep up with my accomplishments and keep my 4.0 all throughout college and be a successful teacher in the near future.

**Abstract:**  The objective of the project is to successfully educate those in Newton’s three laws of motion, and perhaps successfully incorporate the mathematical topic of geometry with the scientific portion of rockets. The project will include multiple small bottle rockets which show how size, shape and the number of fins of the rocket directly impact the size and speed of their take off. This topic will also be composed of some basic physics, and students will learn the terms such as trajectory, acceleration, altitude, velocity, and gravity. Students will use what they have learned to make a proper model to see whose rocket can go the furthest.

**Publications:**  None yet.