Summer Research & Internship Symposium

July 30-31, 2019

35th Annual Department of Chemistry Research Symposium

14th Annual Summer Undergraduate Research Conference
Summer Experiential Learning at Trinity

Students have participated in summer undergraduate research since the 1950s at Trinity, but it wasn’t until 1984 when the Chemistry department sponsored the first Undergraduate Research Symposium that involved 10 participants. In 2019, 145 students engaged in summer research with more than 60 faculty mentors across 25 academic departments. This year, the Symposium also features 100 internship students from the Students+Startups; Arts, Letters, and Enterprise; and Mexico, the Americas, and Spain programs.

The Welch Foundation has supported student and faculty researchers in chemistry since 1997. In addition, grants from the Merck Foundation (2001-2009) and the W. M. Keck Foundation (2003) supported research collaborations between biologists and chemists. The Tim and Karen Hixon Endowment (2013) supports students in summer research in environmental studies, and is awarded for work in the physical sciences, environmental policy or justice, and the humanities.

Grants in 2004 and 2008 from the Howard Hughes Medical Institute provided summer research fellowships for students in addition to transforming Trinity’s curricular offerings in the sciences and enhancing outreach to local schools.

The National Science Foundation (NSF) supported Research Experiences for Undergraduate (REU) Programs at Trinity in chemistry (1989-2000), mathematics (1997-2008) and computer science (2008-2010). In addition to individual faculty research grants, NSF currently supports Trinity programs for scholarships for STEM majors (FAST and FASTER Programs). In addition, the Beckman Foundation supports undergraduate research in Biology, Chemistry, and Neuroscience.

In recent years, undergraduate research in non-STEM fields have developed and grown. In 2008, Trinity started a Ronald E. McNair Post-Baccalaureate Achievement Program with funding from the U.S. Department of Education. In 2011, Trinity launched the Murchison Fellowships program, which funds summer projects proposed by faculty-student teams. The University also supports research opportunities through operating funds. Earlier this year, Trinity received another award from the Andrew W. Mellon Foundation to continue its support of undergraduate research in the arts and humanities. Summer research experiences are also supported in Urban Studies thanks to a grant from the San Antonio Housing Authority. Entrepreneurship students are also engaged in scholarly experiential learning due to grant funding from the Stumberg Foundation and the 80/20 Foundation.

We hope you enjoy the 2019 Summer Research and Internship Symposium!

Drs. Scott Brown & Jacob Tingle, Center for Experiential Learning and Career Success
# Conference Agenda

## Friday, July 26, 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00PM</td>
<td>Antigone in the City (performance)</td>
<td>Attic Theater</td>
</tr>
</tbody>
</table>

## Tuesday, July 30, 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:45-9:15 AM</td>
<td>Keynote Address: Dr. Kelly Lyons</td>
<td>Stieren Theater</td>
</tr>
<tr>
<td>9:30-10:30 AM</td>
<td>Coffee &amp; Poster Session #1</td>
<td>CSI 256/282</td>
</tr>
<tr>
<td>10:45 AM-12:15 PM</td>
<td>Multidisciplinary Oral Presentation Session #1</td>
<td>CSI 437</td>
</tr>
<tr>
<td>12:00-1:30 PM</td>
<td>Lunch Available</td>
<td>CSI Atrium</td>
</tr>
<tr>
<td>1:45-3:15 PM</td>
<td>Multidisciplinary Oral Presentation Session #2A</td>
<td>CSI 437</td>
</tr>
<tr>
<td></td>
<td>Multidisciplinary Oral Presentation Session #2B</td>
<td>CSI 448</td>
</tr>
<tr>
<td>3:30-5:30 PM</td>
<td>Reception &amp; Poster Session #2</td>
<td>CSI 256/282</td>
</tr>
</tbody>
</table>

## Wednesday, July 31, 2019

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:30-9:30 AM</td>
<td>Coffee &amp; Poster Session #3</td>
<td>CSI 256/282</td>
</tr>
<tr>
<td>8:30-10:30 AM</td>
<td>Chemistry Oral Presentation Session #1</td>
<td>CSI 437</td>
</tr>
<tr>
<td>9:45-11:15 AM</td>
<td>Multidisciplinary Oral Presentation Session #3A</td>
<td>CSI 448</td>
</tr>
<tr>
<td></td>
<td>Multidisciplinary Oral Presentation Session #3B</td>
<td>CSI 430</td>
</tr>
<tr>
<td>10:30 AM-12:00 PM</td>
<td>Chemistry Oral Presentation Session #2</td>
<td>CSI 437</td>
</tr>
<tr>
<td>11:30 AM-12:30 PM</td>
<td>Poster Session #4</td>
<td>CSI 256/282</td>
</tr>
<tr>
<td>12:15-1:30 PM</td>
<td>Lunch Available</td>
<td>CSI Atrium</td>
</tr>
<tr>
<td>1:45-2:45 PM</td>
<td>Multidisciplinary Oral Presentation Session #4</td>
<td>CSI 430</td>
</tr>
<tr>
<td>1:45-4:40 PM</td>
<td>Chemistry Oral Presentation Session #3A</td>
<td>CSI 437</td>
</tr>
<tr>
<td></td>
<td>Chemistry Oral Presentation Session #3B</td>
<td>CSI 448</td>
</tr>
</tbody>
</table>
Antigone in the City
Friday, July 26 at 8:00PM
Performance in the Attic Theatre

Antigone in the City
by Rachel Joseph

music by Leah Woehr
directed by Kyle Gillette
dramaturgy by Kirsten Timco
<table>
<thead>
<tr>
<th>#</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Richards</td>
<td>Probing the Rheology of Model Sea Spray Aerosol Particles Using a Dual-Balance Linear Quadrupole Trap as a Micro-Analytical Tool</td>
<td>Davis</td>
</tr>
<tr>
<td>2</td>
<td>Hand</td>
<td>Support Effects for the Selective Hydrogenation of 1-Octyne on Au/MOₓ</td>
<td>Chandler</td>
</tr>
<tr>
<td>3</td>
<td>Bradley</td>
<td>Role of the Metal Support Interface in H₂ Activation on Supported Gold Nanoparticles</td>
<td>Chandler</td>
</tr>
<tr>
<td>4</td>
<td>Acevedo</td>
<td>Probing the Reactivity of Copper-Containing Redox Proteins</td>
<td>Hunsicker-Wang</td>
</tr>
<tr>
<td>5 &amp; 6</td>
<td>Cassingham, Gerick, Kopcho, Leonard, &amp; Ou</td>
<td>Root Endophyte Diversity Among Texas Grasses</td>
<td>Lyons</td>
</tr>
<tr>
<td>7</td>
<td>Carson</td>
<td>Intraspecific Variation in Sperm and Testis Morphology in Lizards</td>
<td>Johnson</td>
</tr>
<tr>
<td>8</td>
<td>Nebhut &amp; Semro</td>
<td>Stress Then Acclimation: Effects of UV Radiation on Kale Growth Pigmentation, and Antioxidant Content</td>
<td>Shinkle</td>
</tr>
<tr>
<td>9</td>
<td>Rascoe</td>
<td>Extreme Mass Accretion and Stars</td>
<td>Pooley</td>
</tr>
<tr>
<td>10</td>
<td>Karla &amp; Muzyka</td>
<td>Dopamine Receptor Dependence of Cocaine-Mediated Changes in Connections onto Midbrain Dopamine Neurons</td>
<td>Beaudoin</td>
</tr>
<tr>
<td>11</td>
<td>Reeves</td>
<td>Investigating the Role of the Lipid Phosphatase Fig4’s Active Site in Direct Regulation of Protein Partners</td>
<td>Strunk</td>
</tr>
<tr>
<td>12</td>
<td>Rizzo</td>
<td>Investigating the Molecular Interactions of the Human Tumor Suppressor PTEN Using its Homolog TEP1 in the <em>S. cerevisiae</em> Model</td>
<td>Strunk</td>
</tr>
<tr>
<td>13</td>
<td>Heliste</td>
<td>Studying the human tumor suppressor PTEN through the lenses of protein interactions and cellular localization of its yeast homolog, Tep1.</td>
<td>Strunk</td>
</tr>
<tr>
<td>14</td>
<td>Moreno &amp; Rodriguez</td>
<td>Changes in Connections Between Neurons Induced by Cocaine</td>
<td>Beaudoin</td>
</tr>
<tr>
<td>15</td>
<td>Boyd</td>
<td>Moving Voting Rights Forward</td>
<td>Crockett</td>
</tr>
<tr>
<td>16</td>
<td>Carr, M.</td>
<td>RAICES: The Refugee Center for Education and Legal Services</td>
<td>Nishikawa</td>
</tr>
<tr>
<td>17</td>
<td>Stringer</td>
<td>Effects of Pharmacotherapeutic Intervention on Contextual Fear</td>
<td>Leong</td>
</tr>
<tr>
<td>18</td>
<td>Patel</td>
<td>Effect of Alcohol Administration on Relative Use of Multiple Memory Systems</td>
<td>Leong</td>
</tr>
<tr>
<td>19</td>
<td>Velarde</td>
<td>Beluga Kissing: Context for the Mouth Game in Beluga Development</td>
<td>Hill</td>
</tr>
<tr>
<td>20</td>
<td>Castillo</td>
<td>Effects of Anxiety on Sucrose-associated Place Preference</td>
<td>Leong</td>
</tr>
<tr>
<td>21</td>
<td>Bieri</td>
<td>Anxiety Maladaptively Enhances Sugar-Seeking Behavior</td>
<td>Leong</td>
</tr>
<tr>
<td>22</td>
<td>Toler</td>
<td>Recreating Primary Source Data for the Ancient Jewish Village of Khirbet Shema</td>
<td>Spigel</td>
</tr>
<tr>
<td>23</td>
<td>Peña</td>
<td>A Westside Story: Esperanza en el Barrio</td>
<td>Tarango</td>
</tr>
<tr>
<td>24</td>
<td>Sumrall-Orsak</td>
<td>Activating Archives: Maintaining, Exhibiting, and Publishing the Exhibition History of Blue Star Contemporary</td>
<td>Ritson</td>
</tr>
<tr>
<td>25</td>
<td>Reinis</td>
<td>ALE Summer Internship: An Introduction to the Texas Art Scene through Ruiz-Healy Art</td>
<td>Ritson</td>
</tr>
<tr>
<td>26</td>
<td>Eskridge</td>
<td>Women Worth Watching: A Comparative Study of Internet Parody</td>
<td>Zhang</td>
</tr>
<tr>
<td>27</td>
<td>Laing</td>
<td>Poll Taxes and Chili Queens: Mayor Maury Maverick, and Civil Liberties in Pre-War San Antonio</td>
<td>Henderson</td>
</tr>
<tr>
<td>28</td>
<td>Rodriguez, C.</td>
<td>The Socio-Cultural Experiences of Mexican-American Recent High School Graduates</td>
<td>Delgado</td>
</tr>
<tr>
<td>29</td>
<td>Bissett</td>
<td>“Negotiating Place” in the Workspace</td>
<td>Soto</td>
</tr>
<tr>
<td>30</td>
<td>Gain</td>
<td>Behind Conference Behind-the-Scenes</td>
<td>Soto</td>
</tr>
<tr>
<td>31</td>
<td>Canada</td>
<td>The Prickly Pear Doesn’t Fall Far From the Cactus: A Summer at Green Spaces Alliance</td>
<td>Carlisle &amp; Leafstedt</td>
</tr>
<tr>
<td>32</td>
<td>Peters</td>
<td>SAY Sí and Me: An Introduction to the Art Side</td>
<td>Hood</td>
</tr>
<tr>
<td>33</td>
<td>Matzakos</td>
<td>ALE Summer Internship: My Time Interning at San Antonio Clubhouse</td>
<td>Kosnik</td>
</tr>
<tr>
<td>34</td>
<td>Ashworth</td>
<td>Creating a Better San Antonio with Nonprofit News</td>
<td>Hood</td>
</tr>
<tr>
<td>35</td>
<td>Thompson, S.</td>
<td>Developing Relationships With the San Antonio Symphony</td>
<td>Persellin</td>
</tr>
<tr>
<td>36</td>
<td>Arbogast</td>
<td>Redirecting Skills: ALE Internship at The Classic Theatre of San Antonio</td>
<td>Connelly</td>
</tr>
<tr>
<td>37</td>
<td>Chavez, I.</td>
<td>Cultural Relevance in Dual Language Classrooms</td>
<td>Delgado</td>
</tr>
<tr>
<td>38</td>
<td>Cisneros</td>
<td>Thoughtful Design Influenced By Contemporary Art</td>
<td>Martinez</td>
</tr>
<tr>
<td>39</td>
<td>Long</td>
<td>Disparities in Well-Women care in Bexar County</td>
<td>Sosnaud</td>
</tr>
<tr>
<td>Page</td>
<td>Name</td>
<td>Title</td>
<td>Author</td>
</tr>
<tr>
<td>------</td>
<td>------------</td>
<td>------------------------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>40</td>
<td>Derrig</td>
<td>RealCo Internship</td>
<td>Aramanda</td>
</tr>
<tr>
<td>41</td>
<td>Barnett, R.</td>
<td>Literature &amp; Coding: My Internship at Youth Code Jam</td>
<td>Martinez</td>
</tr>
<tr>
<td>42</td>
<td>Sanchez</td>
<td>SaaS-y in San Antonio</td>
<td>Martinez</td>
</tr>
<tr>
<td>43</td>
<td>Clark</td>
<td>My Digi Experience</td>
<td>Martinez</td>
</tr>
<tr>
<td>44</td>
<td>Wolf</td>
<td>Internship at NOWCastSA: Lessons From Working at a Nonprofit</td>
<td>Martinez</td>
</tr>
<tr>
<td>45</td>
<td>Alur</td>
<td>Virtually Reality</td>
<td>Martinez</td>
</tr>
<tr>
<td>46</td>
<td>Tolbert</td>
<td>The San Antonio Bridal Experience</td>
<td>Martinez</td>
</tr>
<tr>
<td>47</td>
<td>Claessen</td>
<td>Learning the Ropes at Jungle Disk</td>
<td>Martinez</td>
</tr>
<tr>
<td>48</td>
<td>Gudimetla</td>
<td>TeamPassword + Jungle Disk Internship</td>
<td>Martinez</td>
</tr>
<tr>
<td>49</td>
<td>Jones, J.</td>
<td>A Summer at Moki</td>
<td>Martinez</td>
</tr>
<tr>
<td>50</td>
<td>Contestabili</td>
<td>Synthesis and Fabrication of Norbornene-Thiol Polyethylene Glycol Based Hydrogels as Cytocompatible Scaffolds for the 3D Culture of Glial Cells</td>
<td>Munoz-Pinto</td>
</tr>
<tr>
<td>Poster Session #2</td>
<td>Tuesday, July 30, 3:30-5:30 PM</td>
<td>Center for Sciences &amp; Innovation 256/282 (Design Cube)</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------</td>
<td>---------------------------------</td>
<td>--------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>51 Friedrich &amp; Ruetsche</td>
<td>Atlanteans and Barbarians: Classical Receptions in Games</td>
<td>Stevens</td>
<td></td>
</tr>
<tr>
<td>52 Chapman, Lee, Nuelle, Tvrdy</td>
<td>150 Years of Experiential Learning at Trinity: Context, Perspective and Implementation</td>
<td>Hood, Scherer, &amp; Turek</td>
<td></td>
</tr>
<tr>
<td>53 Pride, Sonnier, Tincher, &amp; R. Williams</td>
<td>Strengthening the Colors of PRIDE: Outreach Methods</td>
<td>Stone</td>
<td></td>
</tr>
<tr>
<td>54 Valadez, Williams, &amp; Zhou</td>
<td>Optimization of a Viral Construct Enabling Neuronal Depolarization with Red Light</td>
<td>Beaudoin</td>
<td></td>
</tr>
<tr>
<td>55 Tang &amp; Taylor</td>
<td>Artificial Light At Night (ALAN): An Anthropogenic Challenge for Urban Lizard Behavior and Physiology</td>
<td>Johnson</td>
<td></td>
</tr>
<tr>
<td>56 Nebhut, Semro, &amp; Yin</td>
<td>The Effects of Short Wavelength UV-B Radiation on Plant Pigmentation Anatomy in Rural and Urban Light Environments</td>
<td>Shinkle</td>
<td></td>
</tr>
<tr>
<td>57 Thompson, M.</td>
<td>Color Morph Distribution of Western Ribbon Snakes (<em>Thamnophis proximus</em>) in Texas</td>
<td>McEntire</td>
<td></td>
</tr>
<tr>
<td>58 Greiner &amp; Pippen</td>
<td>Parasitic or Transactional Juveniles? Why Social Groups Form in the Black-crested Titmouse (<em>Baeolophus atricristatus</em>)</td>
<td>Troy</td>
<td></td>
</tr>
<tr>
<td>59 Hopps</td>
<td>Fluorogenic RAFT Polymerization as a Platform for Biodetection</td>
<td>Cooley</td>
<td></td>
</tr>
<tr>
<td>60 Johnson, N.</td>
<td>WWII’s Forgotten Children: Latin Americans Interned in Texas and Exchanged with Germany</td>
<td>Van Hoy</td>
<td></td>
</tr>
<tr>
<td>61 Bowen</td>
<td>Selfish Plants and Multispecies Communication: Ecofeminism, Critical Plant Studies, Science Fiction, and the Dark Green</td>
<td>Sullivan</td>
<td></td>
</tr>
<tr>
<td>62 Li, Liu, Zhang</td>
<td>Dimension Reduction Using Corr-Lasso Neural Network</td>
<td>Zhang</td>
<td></td>
</tr>
<tr>
<td>63 Carr, V.</td>
<td>Let’s Go to the Library!</td>
<td>Delgado</td>
<td></td>
</tr>
<tr>
<td>64 Acosta</td>
<td>Alvarez Internship Grant at SAReads</td>
<td>Delgado</td>
<td></td>
</tr>
<tr>
<td>65 Cagle</td>
<td>Modeling the Effects of Hyaluronic Acid Degradation on Human Microglia Phenotype</td>
<td>Munoz-Pinto</td>
<td></td>
</tr>
<tr>
<td>66 Jones, A.</td>
<td>Evaluation of the Effects of Lipopolysaccharides (LPS) on Human Astrocyte Phenotype and Metabolism</td>
<td>Munoz-Pinto</td>
<td></td>
</tr>
<tr>
<td>67 Marquez</td>
<td>Analysis of Dashcam Video for Determination of Vehicle Speed</td>
<td>Leifer</td>
<td></td>
</tr>
<tr>
<td>68 Ybarra</td>
<td>Modeling Biofilm Growth In Pipe Flow</td>
<td>Nguyen</td>
<td></td>
</tr>
<tr>
<td>Page</td>
<td>Author(s)</td>
<td>Title</td>
<td>Co-author(s)</td>
</tr>
<tr>
<td>------</td>
<td>--------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-------------------------</td>
</tr>
<tr>
<td>69</td>
<td>Hardzog</td>
<td>Modeling <em>E. coli</em> Chemotaxis in viscous Fluid Near a Surface</td>
<td>Healy, Nguyen &amp; Shindell</td>
</tr>
<tr>
<td>70</td>
<td>Coltharp</td>
<td>Bacterial Motility Near a Surface</td>
<td>Shindell</td>
</tr>
<tr>
<td>71</td>
<td>Hoang &amp; Holt</td>
<td>Bacterial Motility Near a Smooth Surface: Experiments and Analysis</td>
<td>Healy, Hoang, Nguyen &amp; Shindell</td>
</tr>
<tr>
<td>72</td>
<td>Heridia</td>
<td>Returning to Normalcy: The Perils of Restoration Politics</td>
<td>Crockett</td>
</tr>
<tr>
<td>73</td>
<td>Baez</td>
<td>Summer at RAICES</td>
<td>Nishikawa</td>
</tr>
<tr>
<td>74</td>
<td>Smith &amp; Weathers</td>
<td>Connections IFS Internship</td>
<td>Childers</td>
</tr>
<tr>
<td>75</td>
<td>Capps, Cutilletta &amp; Lewis</td>
<td>Can Children compare Events Over a Delay to Learn Verbs?</td>
<td>Childers</td>
</tr>
<tr>
<td>76</td>
<td>Elsadig, Gastón-Panthaki &amp; Stafford</td>
<td>Examining Links Between Actions and Verbs in Cross-Cultural Settings</td>
<td>Childers</td>
</tr>
<tr>
<td>77</td>
<td>Bearman</td>
<td>Hair Cortisol Concentration in Chimpanzees (<em>Pan troglodytes</em>) and its Correlates</td>
<td>Phillips</td>
</tr>
<tr>
<td>78</td>
<td>Siddiqui</td>
<td>San Antonio’s Nonprofit Sector: The World of Fast-Paced Consulting</td>
<td>Dupertuis</td>
</tr>
<tr>
<td>79</td>
<td>Wilson</td>
<td>Revolutionizing Clinical Trials with Patch Technologies, Inc.</td>
<td>Martinez</td>
</tr>
<tr>
<td>80</td>
<td>Magee</td>
<td>LuxTurn Technologies LLC</td>
<td>Martinez</td>
</tr>
<tr>
<td>81</td>
<td>Ibeh &amp; Ramos</td>
<td>Spreading Stories with Comics and Kids</td>
<td>Martinez</td>
</tr>
<tr>
<td>82</td>
<td>Flexner</td>
<td>Trending Upward</td>
<td>Martinez</td>
</tr>
<tr>
<td>Session</td>
<td>Name</td>
<td>Title</td>
<td>Advisor</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
<td>----------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>83</td>
<td>Gallington</td>
<td>Supporting San Antonio’s Forgotten Community with Catholic Charities</td>
<td>Hood</td>
</tr>
<tr>
<td>84</td>
<td>Jernt</td>
<td>Working with Immigrants: A Summer Internship at RAICES</td>
<td>Tingle</td>
</tr>
<tr>
<td>85</td>
<td>Killinger</td>
<td>Marketing Nonprofit News</td>
<td>Hood</td>
</tr>
<tr>
<td>86</td>
<td>De Luna</td>
<td>Building Bridges with the San Antonio Community: My Time Interning with RAICES</td>
<td>Tingle</td>
</tr>
<tr>
<td>87</td>
<td>Bourgeois</td>
<td>A Summer in the Office of State Representative Diego Bernal</td>
<td>Balreira</td>
</tr>
<tr>
<td>88</td>
<td>Farley</td>
<td>A History of Music at Trinity: 1869-1952</td>
<td>Leafstedt</td>
</tr>
<tr>
<td>89</td>
<td>Chin</td>
<td>The Song that Data Sings: My Summer Internship at the Children's Chorus of San Antonio</td>
<td>Leafstedt</td>
</tr>
<tr>
<td>90</td>
<td>Hooper</td>
<td>Finding the Beat: Learning What Makes a Nonprofit Run</td>
<td>Leafstedt</td>
</tr>
<tr>
<td>91</td>
<td>Reddi</td>
<td>Cool Beans Coaching</td>
<td>Martinez</td>
</tr>
<tr>
<td>92</td>
<td>Bouls</td>
<td>NOWCastSA Sales Internship: An Overview of working for a Non-profit</td>
<td>Martinez</td>
</tr>
<tr>
<td>93</td>
<td>Kasierski</td>
<td>My Internship with the Onsi Group</td>
<td>Martinez</td>
</tr>
<tr>
<td>94</td>
<td>Ault</td>
<td>My Experience at the Onsi Group</td>
<td>Martinez</td>
</tr>
<tr>
<td>95</td>
<td>Molina</td>
<td>Easy Expunctions Summer Internship</td>
<td>Martinez</td>
</tr>
<tr>
<td>96</td>
<td>Ahmed</td>
<td>Connecting the world with IOT</td>
<td>Martinez</td>
</tr>
<tr>
<td>97</td>
<td>Galbraith</td>
<td>Interning at Innocenti Jones</td>
<td>Martinez</td>
</tr>
<tr>
<td>98</td>
<td>Ward</td>
<td>Textboxes, Submit Buttons, and Headers</td>
<td>Martinez</td>
</tr>
<tr>
<td>99</td>
<td>Lauerman</td>
<td>GaitIQ: The Link Between Alzheimer's and Gait</td>
<td>Martinez</td>
</tr>
<tr>
<td>100</td>
<td>Adessa</td>
<td>Summer, Sun, and Smart Solar</td>
<td>Martinez</td>
</tr>
<tr>
<td>101</td>
<td>George</td>
<td>A Summer's Worth of Dissecting Websites, Investigating Competition, &amp; Content Creation</td>
<td>Martinez</td>
</tr>
<tr>
<td>102</td>
<td>Akins</td>
<td>Tracking User Activity</td>
<td>Martinez</td>
</tr>
<tr>
<td>103</td>
<td>Bolding</td>
<td>Summer at The Impact Guild</td>
<td>Martinez</td>
</tr>
<tr>
<td>104</td>
<td>Frausto</td>
<td>La Escuela De Estella</td>
<td>Martinez</td>
</tr>
<tr>
<td>Page</td>
<td>Name</td>
<td>Title</td>
<td>Professor</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
<td>-----------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>105</td>
<td>Suarez, J.</td>
<td>Innovative Community Solar Launch</td>
<td>Martinez</td>
</tr>
<tr>
<td>106</td>
<td>Rech</td>
<td>Willie and Roo</td>
<td>Martinez</td>
</tr>
<tr>
<td>107</td>
<td>Sykes &amp; Perkins</td>
<td>heARTful</td>
<td>Martinez</td>
</tr>
<tr>
<td>108</td>
<td>Chavez, J.</td>
<td>Tech Talent Summer</td>
<td>Martinez</td>
</tr>
<tr>
<td>109</td>
<td>Kodadek</td>
<td>Students + Startups Internship: The Onsi Group</td>
<td>Martinez</td>
</tr>
<tr>
<td>110</td>
<td>Liggins</td>
<td>Specialty Software: Ease, Analyze, and Resolve</td>
<td>Martinez</td>
</tr>
<tr>
<td>111</td>
<td>Miller</td>
<td>Jungle Disk Internship</td>
<td>Martinez</td>
</tr>
<tr>
<td>112</td>
<td>Ramirez</td>
<td>Scraffic Internship 2019</td>
<td>Martinez</td>
</tr>
<tr>
<td>113</td>
<td>Brasel</td>
<td>Sales and Customer Success</td>
<td>Martinez</td>
</tr>
<tr>
<td>114</td>
<td>Guerrero</td>
<td>Live Monitoring Keg Contents</td>
<td>Martinez</td>
</tr>
<tr>
<td>115</td>
<td>Plante</td>
<td>The Application of Fengshui to Ecological Urbanization</td>
<td>Field</td>
</tr>
<tr>
<td>116</td>
<td>Washington</td>
<td>Undergraduate Research in the Arts and Humanities: Student Perceptions of the Self, their Research, and the Mellon Initiative</td>
<td>Jasinski</td>
</tr>
<tr>
<td>117</td>
<td>Lehrmann</td>
<td>Studying in Azores with the Rhode Island School of Design: Landscape Sketching, Traditional Craft, Sustainable Design, and Woodworking</td>
<td>Briggs</td>
</tr>
<tr>
<td>118</td>
<td>Macias</td>
<td>RAICES: Connecting the Roots of People</td>
<td>Nishikawa</td>
</tr>
<tr>
<td>119</td>
<td>Huezo</td>
<td>The Function of Geography and Socioeconomic Variables in Loan Success</td>
<td>Huston</td>
</tr>
</tbody>
</table>
## Poster Session #4

**Wednesday 11:30 AM-12:30 PM**

**Center for Sciences & Innovation 256/282 (Design Cube)**

<table>
<thead>
<tr>
<th>120</th>
<th>Matyastik</th>
<th>S+S Summer Internship at Scaleworks with Earth Class Mail</th>
<th>Martinez &amp; Tamayo</th>
</tr>
</thead>
<tbody>
<tr>
<td>121</td>
<td>Lopez, D.</td>
<td>Summer ’19 Internship: SiteOwl</td>
<td>Martinez</td>
</tr>
<tr>
<td>122</td>
<td>Lemos Ferreira</td>
<td>My Internship at SitePro!</td>
<td>Martinez</td>
</tr>
<tr>
<td>123</td>
<td>Abeyta</td>
<td>SEO Optimization</td>
<td>Martinez</td>
</tr>
<tr>
<td>124</td>
<td>Chung</td>
<td>Summer Internship: Software Company Acquisitions</td>
<td>Martinez</td>
</tr>
<tr>
<td>125</td>
<td>Matthewson</td>
<td>UX Design</td>
<td>Martinez</td>
</tr>
<tr>
<td>126</td>
<td>Fletcher-Bai</td>
<td>Defining Success: Stories of SA Small Businesses</td>
<td>Martinez</td>
</tr>
<tr>
<td>127</td>
<td>Phan, W.</td>
<td>Students + Startup Internship at the San Antonio Bar Association</td>
<td>Martinez</td>
</tr>
<tr>
<td>128</td>
<td>Ochoa</td>
<td>Auditing at the Onsi Group to Ensure SCA Compliance</td>
<td>Martinez</td>
</tr>
<tr>
<td>129</td>
<td>Towers</td>
<td>Excelling at EPIcenter</td>
<td>Martinez</td>
</tr>
<tr>
<td>130</td>
<td>Virani</td>
<td>Data Science at SitePro</td>
<td>Martinez</td>
</tr>
<tr>
<td>131</td>
<td>Lacy</td>
<td>Redesigning SABA’s Lawyer Referral Service</td>
<td>Martinez</td>
</tr>
<tr>
<td>132</td>
<td>Volzer</td>
<td>Customer Success at Earth Class Mail</td>
<td>Martinez &amp; Uptmore</td>
</tr>
<tr>
<td>133</td>
<td>Suarez, I.</td>
<td>Digitizing the Dirty Work</td>
<td>Martinez &amp; Pereida</td>
</tr>
<tr>
<td>134</td>
<td>Davis</td>
<td>My Mark on Marketing</td>
<td>Jeon, Martinez, &amp; Sosa</td>
</tr>
<tr>
<td>135</td>
<td>Desai</td>
<td>What’s up at Codeup?</td>
<td>Martinez</td>
</tr>
<tr>
<td>136</td>
<td>Korando</td>
<td>Summer summery</td>
<td>Martienz</td>
</tr>
<tr>
<td>137</td>
<td>Hanley</td>
<td>THG Ingenuity Summer Internship</td>
<td>Martinez &amp; Stewart</td>
</tr>
<tr>
<td>138</td>
<td>Phan, S.</td>
<td>SitePro Internship</td>
<td>Dantapally &amp; Martinez</td>
</tr>
<tr>
<td>139</td>
<td>Skinner</td>
<td>Sales, Science, and Innovation</td>
<td>Martinez &amp; Zietelman</td>
</tr>
<tr>
<td>140</td>
<td>Canepa</td>
<td>A Numbers Game</td>
<td>Martinez &amp; Reynolds</td>
</tr>
<tr>
<td>141</td>
<td>Garza</td>
<td>Server Creation and Automation with Ansible</td>
<td>Ibarra &amp; Martinez</td>
</tr>
<tr>
<td>142</td>
<td>Yun</td>
<td>Exploring Computer Science Education in San Antonio</td>
<td>Martinez</td>
</tr>
<tr>
<td>143</td>
<td>Koob</td>
<td>SkateCuff Summer Experience</td>
<td>Martinez</td>
</tr>
<tr>
<td>144</td>
<td>Joseph</td>
<td>A Good Kind of Experience</td>
<td>Martinez</td>
</tr>
<tr>
<td>145</td>
<td>Campbell</td>
<td>Dura Software</td>
<td>Martinez</td>
</tr>
<tr>
<td>146</td>
<td>Garriga</td>
<td>City Education Partners Internship</td>
<td>Martinez</td>
</tr>
<tr>
<td>147</td>
<td>Sandoval</td>
<td>Not Your Average Internship</td>
<td>Martinez</td>
</tr>
<tr>
<td>148</td>
<td>Garcia</td>
<td>Summer as Strategy Intern at Tribu</td>
<td>Martinez</td>
</tr>
<tr>
<td>149</td>
<td>Butterfield</td>
<td>Jungle disk internship</td>
<td>Martinez</td>
</tr>
<tr>
<td>150</td>
<td>Creedon &amp; Ho</td>
<td>Developing High Noon</td>
<td>Bartlett</td>
</tr>
<tr>
<td>151</td>
<td>Rawlins</td>
<td>The Sylph as a Mouthpiece: Exploring the Influence of Ballet-Inflected Language on Non-Ballet Spheres in 19th-Century England</td>
<td>Tontiplaphol</td>
</tr>
<tr>
<td>152</td>
<td>Vazquez</td>
<td>Examining How Rap Music Criticizes Political Environments in Russia</td>
<td>Chapman &amp; Hill</td>
</tr>
<tr>
<td>153</td>
<td>Bartling-John</td>
<td>Evaluating the Effects of Body Location on Hair Cortisol Concentration in Marmosets</td>
<td>Phillips</td>
</tr>
<tr>
<td>154</td>
<td>Ready</td>
<td>An Account of the Self</td>
<td>Luper</td>
</tr>
<tr>
<td>155</td>
<td>Bjeletich</td>
<td>Philosophy for Children: Philosophy in Praxis</td>
<td>Norman</td>
</tr>
<tr>
<td>156</td>
<td>Lee</td>
<td>Speech Emotion Recognition with Two-Dimensional Grading</td>
<td>Jiang</td>
</tr>
<tr>
<td>157</td>
<td>Kruger</td>
<td>Racial Inequalities in Infant Mortality in U.S. Counties</td>
<td>Sosnaud</td>
</tr>
<tr>
<td>158</td>
<td>Timco</td>
<td>Invisible Threads</td>
<td>Joseph</td>
</tr>
</tbody>
</table>
**Oral Presentations: Multidisciplinary Session #1**  
**Tuesday, July 30, 10:45 AM-12:15 PM**  
**Moderator: Dr. Gina Anne Tam**  
**CSI 437**

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10:45</td>
<td>Vanover</td>
<td>Heliospheric Pickup Ion Surveys with the Hot Plasma Composition Analyzer of the Magnetospheric Multiscale Mission (MMS-HPCA)</td>
<td>Cardenas, Fuselier, &amp; Gomez</td>
</tr>
<tr>
<td>2</td>
<td>11:00</td>
<td>Lopez, K.</td>
<td>Her Truth: Gender, Sexual Violence, and Credibility in 13 Reasons Why</td>
<td>Erickson</td>
</tr>
<tr>
<td>3</td>
<td>11:15</td>
<td>Del Vecchio</td>
<td>Ethical Applications of Trauma Theory to Art Historical Inquiry</td>
<td>Schreyach</td>
</tr>
<tr>
<td>4</td>
<td>11:30</td>
<td>Young</td>
<td>Holocaust Representation Through Two Contemporary Graphic Memoirs</td>
<td>Aarons</td>
</tr>
<tr>
<td>5</td>
<td>11:45</td>
<td>Abila</td>
<td>First and Second-Generation Immigrants Stories: Their Attitudes Towards Migrants in San Antonio, Texas</td>
<td>Aloisi &amp; McGuire</td>
</tr>
<tr>
<td>6</td>
<td>12:00</td>
<td>Poovathoor</td>
<td>The Image of Asylum Seekers in San Antonio, Texas</td>
<td>Jalalzai</td>
</tr>
</tbody>
</table>

**Oral Presentations: Multidisciplinary Session #2A**  
**Tuesday, July 30, 1:45-3:15 PM**  
**Moderator: Dr. Aaron Delwiche**  
**CSI 437**

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1:45</td>
<td>Parris &amp; Herink</td>
<td>Creating a Professional Theatre Production: From Research to Performance</td>
<td>Stith</td>
</tr>
<tr>
<td>8</td>
<td>2:00</td>
<td>Nguyen</td>
<td>The Performative Rhetoric of Horace in the Odes</td>
<td>O’Sullivan &amp; Salomon</td>
</tr>
<tr>
<td>9</td>
<td>2:15</td>
<td>Smetzer</td>
<td>The Digital Veil of Ignorance: Using Video Games to Create Immersive Thought Experiments</td>
<td>Delwiche</td>
</tr>
<tr>
<td>10</td>
<td>2:30</td>
<td>Oviedo</td>
<td>My Summer Working at Tribu: Marketing and Beyond</td>
<td>Martinez</td>
</tr>
<tr>
<td>11</td>
<td>2:45</td>
<td>Dennis</td>
<td>Where Do Brown Anole Lizards Lay Their Eggs?</td>
<td>Johnson</td>
</tr>
</tbody>
</table>
## Oral Presentations: Multidisciplinary Session #2B
**Tuesday, July 30, 1:45-3:15 PM**
**Moderator: Dr. Frank Healy**
**CSI 448**

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>1:45</td>
<td>Hofman</td>
<td>From Cofounder to Launch SA Intern</td>
<td>Martinez</td>
</tr>
<tr>
<td>13</td>
<td>2:00</td>
<td>Koellmann</td>
<td>Evaluating the Effects of Co-Contaminants Ethanol and Nitrate on BTEX Biodegradation Using a Multi-Species Numerical Model</td>
<td>Ziegler</td>
</tr>
<tr>
<td>14</td>
<td>2:15</td>
<td>Grisham &amp; Jackson</td>
<td>Extreme Mass Accretion in Young Stars</td>
<td>Pooley</td>
</tr>
<tr>
<td>15</td>
<td>2:30</td>
<td>Guerrero</td>
<td>“Supersoft” X-ray Quasars &amp; their Spin</td>
<td>Pooley</td>
</tr>
<tr>
<td>16</td>
<td>2:45</td>
<td>Barnett, N. &amp; Braley</td>
<td>Gravitationally Lensed Super-Massive Black Holes</td>
<td>Pooley</td>
</tr>
</tbody>
</table>

## Oral Presentations: Multidisciplinary Session #3A
**Wednesday, July 31, 9:45 – 11:15 AM**
**Moderator: Dr. Jim Shinkle**
**CSI 448**

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>17</td>
<td>9:45</td>
<td>Helsel</td>
<td>Art School: Learning How the Arts are Financed</td>
<td>Ritson</td>
</tr>
<tr>
<td>18</td>
<td>10:00</td>
<td>Pigott</td>
<td>Digital Archives and the Keyword Search: How History GetsFound</td>
<td>Tam</td>
</tr>
<tr>
<td>19</td>
<td>10:15</td>
<td>Sedano</td>
<td>Impact Jones</td>
<td>Martinez</td>
</tr>
<tr>
<td>20</td>
<td>10:30</td>
<td>Wise</td>
<td>The Good Kind of Experience</td>
<td>Martinez</td>
</tr>
<tr>
<td>21</td>
<td>10:45</td>
<td>Gekiere</td>
<td>Somehow I Manage: An Intern’s Look at Expectations</td>
<td>Leafstedt</td>
</tr>
<tr>
<td>22</td>
<td>11:00</td>
<td>Jesielowski</td>
<td>A Natural Perspective: Interning at The Nature Conservancy</td>
<td>Shinkle</td>
</tr>
</tbody>
</table>
### Oral Presentations: Multidisciplinary Session #3B
Wednesday, July 31, 9:45 – 11:15 AM
Moderator: Dr. Seth Fogarty
CSI 430

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>9:45</td>
<td>Lummus</td>
<td>Competitive Sorption of Florescent Dye and Groundwater Contaminants on Granular Activated Carbon</td>
<td>Ziegler</td>
</tr>
<tr>
<td>24</td>
<td>10:00</td>
<td>Dill</td>
<td>Drought-Tolerant Food Forests as a Solution to Climate-Fueled Food Price Volatility</td>
<td>Hazleton</td>
</tr>
<tr>
<td>25</td>
<td>10:15</td>
<td>McLaren</td>
<td>Dsmodels in Action</td>
<td>Fogarty &amp; Balreira</td>
</tr>
<tr>
<td>26</td>
<td>10:30</td>
<td>Smoker</td>
<td>Economic Phase Diagrams: Visualization and Simulation</td>
<td>Fogarty</td>
</tr>
<tr>
<td>27</td>
<td>10:45</td>
<td>Jones, K.</td>
<td>Trace Element Mobilization in a Crude Oil-Contaminated Aquifer</td>
<td>Ziegler</td>
</tr>
</tbody>
</table>

### Oral Presentations: Multidisciplinary Session #4
Wednesday, July 31, 1:45 – 2:45 PM
Moderator: Dr. Tim O'Sullivan
CSI 430

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>1:45</td>
<td>Tao</td>
<td>How To (Posthumously) Do Things With Words: Speech Acts in Latin Epitaphs</td>
<td>O’Sullivan</td>
</tr>
<tr>
<td>29</td>
<td>2:00</td>
<td>Lopez, J.</td>
<td>Las Abuelitas y Sus Obras de Amor: Material Culture and the Hidden Histories of Latinas’ Creative Work at La Trinidad United Methodist Church</td>
<td>Tarango</td>
</tr>
<tr>
<td>30</td>
<td>2:15</td>
<td>Woehr</td>
<td>Actor, Traveler, American: Exploring Intercultural Communication in Theatre</td>
<td>Gillette</td>
</tr>
<tr>
<td>31</td>
<td>2:30</td>
<td>Ali</td>
<td>Educating Muslim Leaders in North America</td>
<td>Jalalzai</td>
</tr>
</tbody>
</table>
### Chemistry Session 1 ● Wednesday, July 31, 8:30-10:30 AM

**Moderator: Dr. Christina Cooley**

**Center for Sciences & Innovation 437 (Treehouse)**

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>8:50AM</td>
<td>Richards, Hajek-Herrera, &amp; Trobaugh</td>
<td>Development and Use of a Dual-Balance Linear Quadrupole Trap as a Micro-Analytical Tool for Probing the Rheology of Levitated Model Sea Spray Aerosol Particles</td>
<td>Davis</td>
</tr>
<tr>
<td>34</td>
<td>9:15AM</td>
<td>Bradley &amp; St. John</td>
<td>Role of the Metal Support Interface and Particle Size in H₂ Activation on Supported Gold Nanoparticles</td>
<td>Chandler</td>
</tr>
<tr>
<td>35</td>
<td>9:35AM</td>
<td>Goldstein</td>
<td>Energetics and Interfacial Interactions of Spliceosomal Protein Dib1 Predicted with MD Simulations</td>
<td>Cheng &amp; Maeder</td>
</tr>
<tr>
<td>36</td>
<td>9:50AM</td>
<td>Warden</td>
<td>Synthesis and Characterization of Modified Cucurbit[n]urils</td>
<td>Urbach</td>
</tr>
<tr>
<td>37</td>
<td>10:10AM</td>
<td>Darbro &amp; Pacheco</td>
<td>Understanding the Dissociation of D₂ and H₂ on Metal Catalysts Using IR Spectroscopy</td>
<td>Pursell</td>
</tr>
</tbody>
</table>

### Chemistry Session 2 ● Wednesday, July 31, 10:30 AM-12:00 PM

**Moderator: Dr. Ryan Davis**

**Center for Sciences & Innovation 437 (Treehouse)**

<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38</td>
<td>10:30AM</td>
<td>Acevedo</td>
<td>Probing the Reactivity of Copper-Containing Redox Proteins</td>
<td>Hunsicker-Wang</td>
</tr>
<tr>
<td>39</td>
<td>10:45AM</td>
<td>Muppala</td>
<td>Chemical Characterization of Amber and Plant Exudates</td>
<td>Lambert</td>
</tr>
<tr>
<td>40</td>
<td>11:00AM</td>
<td>Barondeau, Ocampo &amp; Wang</td>
<td>Expression and Purification of Proteins Relevant to Superoxide Detoxification</td>
<td>Shearer</td>
</tr>
<tr>
<td>41</td>
<td>11:25AM</td>
<td>Clements</td>
<td>Supramolecular Studies of Intrinsically Disordered Peptides</td>
<td>Urbach</td>
</tr>
<tr>
<td>42</td>
<td>11:40AM</td>
<td>Bate &amp; Fan</td>
<td>Synthesis and Evaluation of Prodrugs for Targeting Disease</td>
<td>Cooley</td>
</tr>
<tr>
<td>#</td>
<td>Time</td>
<td>Presenter(s)</td>
<td>Title</td>
<td>Mentor(s)</td>
</tr>
<tr>
<td>----</td>
<td>--------</td>
<td>-------------------</td>
<td>----------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>43</td>
<td>1:45PM</td>
<td>Bajomo &amp; Sample</td>
<td>Hammett Studies on Supported Au Nanoparticle Catalysts</td>
<td>Chandler</td>
</tr>
<tr>
<td>44</td>
<td>2:05PM</td>
<td>Xu</td>
<td>Universality in Kinetic Models of Circadian Rhythms in <em>Arabidopsis thaliana</em></td>
<td>Shindell</td>
</tr>
<tr>
<td>45</td>
<td>2:20PM</td>
<td>Anderson</td>
<td>Utilizing Click Chemistry to Enhance the Solubility of Aromatic Compounds in Aqueous Media</td>
<td>Cooley</td>
</tr>
<tr>
<td>46</td>
<td>2:35PM</td>
<td>Van Zile</td>
<td>Creating Receptor Binding Sites by Selective Enzymatic Processing</td>
<td>Urbach</td>
</tr>
<tr>
<td>47</td>
<td>2:50PM</td>
<td>Johnson, C.</td>
<td>Emergence of Quantum Chaos in a Four Body System</td>
<td>Mehta</td>
</tr>
</tbody>
</table>

**Break (3:05pm)**

<p>| 48 | 3:20PM | Moore           | Traffic Jam: Measuring the Glass Transition in a Dense 2D Colloidal Fluid | Shindell  |
| 49 | 3:35PM | Hand &amp; Gonzalez | Bimetallic Characterization Using O₂ Activation and Selective Hydrogenation | Chandler  |
| 50 | 3:55PM | Cha &amp; Lavoie    | A Supramolecular Approach to Affinity Controlled Release               | Urbach    |
| 51 | 4:15PM | Laskowski       | Describing Ultracold Molecular Collisions                              | Mehta     |
| 52 | 4:30PM | Baer            | Effect of Rough Surface on Artificial Cell Adhesion                    | Shindell  |</p>
<table>
<thead>
<tr>
<th>#</th>
<th>Time</th>
<th>Presenter(s)</th>
<th>Title</th>
<th>Mentor(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>53</td>
<td>1:45PM</td>
<td>Lopez, R.</td>
<td>Elucidating the Effects of Distal Charges on the Reduction Potential of the Rieske Protein</td>
<td>Hunsicker-Wang</td>
</tr>
<tr>
<td>54</td>
<td>2:00PM</td>
<td>Valadez &amp; Williams</td>
<td>Optimization of a Viral Construct Enabling Neuronal Depolarization with Red Light</td>
<td>Beaudoin</td>
</tr>
<tr>
<td>55</td>
<td>2:15PM</td>
<td>Pittner</td>
<td>The Effects of Dib1 C-terminal Truncations on Splicing Activity in S. cerevisiae</td>
<td>Maeder</td>
</tr>
<tr>
<td>56</td>
<td>2:30PM</td>
<td>Khan</td>
<td>Investigating Protein-Protein Interactions of the PI-Phosphate Fig4 Toward insights into Fig4-Related Neurodegenerative Diseases</td>
<td>Strunk</td>
</tr>
<tr>
<td>57</td>
<td>2:45PM</td>
<td>Bullock &amp; Jamison</td>
<td>Investigating the Autocleavage Activity of Yeast and Human Spliceosomal Protein Dib1</td>
<td>Maeder</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Break (3:05pm)</strong></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>3:20PM</td>
<td>Coleman</td>
<td>Cloning of the <em>Escherichia coli</em> Methyl-accepting Chemotaxis Protein Tar and Characterization of Nickel Repellent Interactions</td>
<td>Healy</td>
</tr>
<tr>
<td>59</td>
<td>3:35PM</td>
<td>Beito &amp; Sunesra</td>
<td>Establishing the Role of the Rieske Reduction Potential in the Formation of Reactive Oxygen Species in Complex III</td>
<td>Hunsicker-Wang</td>
</tr>
<tr>
<td>60</td>
<td>3:55PM</td>
<td>McGrath</td>
<td>Prp8: A Look at the Core of the Sliceosome</td>
<td>Maeder</td>
</tr>
<tr>
<td>61</td>
<td>4:10PM</td>
<td>Karla &amp; Muzyka</td>
<td>Dopamine Receptor Dependence of Cocaine-Mediated Changes in Connections onto Midbrain Dopamine Neurons</td>
<td>Beaudoin</td>
</tr>
<tr>
<td>62</td>
<td>4:25PM</td>
<td>Hopps &amp; DeWitt</td>
<td>Photoinitiated Fluorogenic Polymerization for Biomolecular Detection</td>
<td>Cooley</td>
</tr>
</tbody>
</table>
Abstracts

The following pages are presentation abstracts. This legend may be used for authors:

Names in **bold** are current undergraduate students.

Names followed by an asterisk (*) are presenters.

Names **underlined** are current faculty mentors.
Probing the Rheology of Model Sea Spray Aerosol Particles Using a Dual-Balance Linear Quadrupole Trap as a Micro-Analytical Tool

David S. Richards*, Kristin L. Trobaugh, Ryan D. Davis

Atmospheric aerosol particles play a large role in climate and air quality. Sea spray aerosol (SSA), transferred to the atmosphere via bubble bursting at the ocean surface, represent a large fraction of naturally occurring aerosol particles. Thus, understanding the physico-chemical properties of SSA is therefore of extreme relevance towards understanding atmospheric and climate processes. SSA is known to have a large organic fraction in addition to the inorganic components of ocean water. The organic fraction can include biologically-derived saccharides, among other compounds. In controlled laboratory studies, compounds found in SSA can take on a wide range of physical states, including glassy and gelatinous. For example, aqueous monosaccharide aerosols are known to exist as ultra-viscous or glassy particles, dependent on the RH. However, a comprehensive understanding of the rheological properties (such as viscosity) of mixed organic-inorganic aerosol particles remains lacking. In particular, the role of gel formation is poorly understood because the solute concentration in aerosol micro-environments can greatly exceed what is possible in a bulk solution. New micro-analytical techniques are thus necessary to fully explore the rheological properties of aerosol particles under atmospheric conditions.

Here, we present a new experimental technique to probe the micro-rheological properties of levitated aerosol particles and explore gel formation in aerosols. In order to experimentally characterize the viscosity and gel structure of various organic-inorganic mixtures in aerosol form, electrostatically induced collisions of levitated droplets composed of known saccharide-salt composition were performed using a dual-balance quadrupole electrodynamic balance. Charged aerosol droplets were radially confined within the quadrupole trap where counterbalance electrodes then vertically levitated the droplets in a contactless environment. With the inclusion of two counterbalance electrodes, droplets of opposite polarity were trapped and equilibrated under a given RH and then subsequently merged. The viscosity and/or phase of the droplet was then determined by various optical imaging techniques. We demonstrate that aerosols that contain both organic and certain inorganic salt components can exist in a gelatinous phase. The technical details of our newly developed micro-analytical technique will be discussed along with the micro-rheological results.

Funding Source: Murchison Undergraduate Research Fellowship
Support Effects for the Selective Hydrogenation of 1-Octyne over Au/MO\textsubscript{x}  

Rochelle Hand*, Bert Chandler

The selective hydrogenation of alkynes into alkenes is a vital reaction to the polymer industry. Polyolefin feedstocks, such as ethylene or propylene typically contain ~2-5% alkyne impurities. This concentration must be less than 10 ppm to avoid poisoning the downstream polymerization catalysts. Currently, Pd-based catalysts are used to selectively convert alkynes into alkenes. However, Pd itself will over-hydrogenate and convert the feed into alkanes. Gold catalysts are a promising alternative to Pd due to weak ethylene binding that results in a greater selectivity. However, Au deactivates within a few days and requires process temperatures > 200 °C. This study quantifies how the electronic modification of interface Au atoms by the MO\textsubscript{x} support affect the rate of alkyne hydrogenation.

Supported Au catalysts were synthesized through a colloidal method to ensure consistent Au particle sizes. Supports included Al\textsubscript{2}O\textsubscript{3}, TiO\textsubscript{2}, and SiO\textsubscript{2}. Initial activity was measured with lightoff curves for the hydrogenation of 1-octyne, an analog for acetylene. Kinetic parameters (E\textsubscript{app}, 1-octyne order, H\textsubscript{2} order) were also determined. The results for all of the catalysts were nearly identical, suggesting that the electronic effects from the support are kinetically negligible. \textit{In-situ} alkyne adsorption experiments and DFT simulations show significant alkyne adsorption on interface Au NP’s and hydroxylated support sites. The mechanism most consistent with our kinetic data includes the non-competitive activated adsorption of H\textsubscript{2}. The adsorption of 1-octyne was observed via FTIR for selected catalysts.

Funding Source: National Science Foundation
Role of the Metal Support Interface in H₂ Activation on Supported Gold Nanoparticles

Alex Bradley*, Allison St. John, Dr. Bert Chandler

Department of Chemistry, Trinity University, San Antonio, Texas 78212

Global Hydrogen production exceeds 50 million tons per year, largely for ammonia synthesis in the production of nitrogen fertilizers. Given its technical importance, developing a fundamental understanding of hydrogen activation is vital for designing new catalysts. Hydrogen is thought to activate homolytically on late transition metals, but recent evidence suggests that it activates heterolytically at the metal-support interface of supported gold catalysts.

This study utilized a Van’t Hoff analysis of H₂ oxidation kinetic measurements to determine thermodynamic properties associated with hydrogen binding and activation over supported Au catalysts. The thermodynamic values determined were $\Delta H = -23 \pm 5$ kJ/mol, $\Delta S = 50 \pm 10$ J/mol*K for the Au/TiO₂ catalyst, and $\Delta H = -51 \pm 8$ kJ/mol, $\Delta S = 140 \pm 60$ J/mol*K for the Au/Al₂O₃, which are different from the values found in the literature on non-gold catalysts. The entropic difference likely stems from the heterolytic activation of hydrogen, leaving a proton on the metal oxide support with a higher degree of freedom than a hydride on a metal center. Taking advantage of gold’s thiophilicity, we also developed a cysteine / Ellman’s reagent titration to evaluate Au particle size with UV-visible spectroscopy. These two techniques were combined to determine how particle size affects the reaction kinetics and H2 binding thermodynamics.
Probing the Reactivity of Copper-Containing Redox Proteins

Zachary Acevedo*, Laura Hunsicker-Wang, Ph.D.

The electron transport chain is a series of protein complexes that couple electron shuttling with proton pumping in order to create an electrochemical gradient. The gradient is then utilized by ATP synthase to create ATP and energy for the cell. The first redox site of the terminal complex, Complex IV, from the *Thermus thermophilus* bacteria has been isolated as *TtCuA*. *TtCuA*’s redox center contains two copper ions, in distorted tetrahedral environments, that are bridged by two cysteines and ligated by two histidines and two weak axial ligands. H157 of *TtCuA*, a solvent exposed ligating histidine, and the two non-ligating histidines have demonstrated modification by diethyl pyrocarbonate (DEPC), an exogenous chemical modifier that can modify primary amines, deprotonated histidines, and tyrosines. The modification of *TtCuA*’s histidines by DEPC does not show pH-dependence, indicative of fast proton exchange between the solvent and the histidine nitrogens favoring modification over deprotonation. The H157 adduct does appear to be removed over 48 hours at room temperature, as supported by mass spectrometry, electrochemistry, and visible CD spectroscopy. This is one of two adduct removals observed, indicating the lability of bonds with the H157 Nε. It is possible this nitrogen is involved in proton pumping through Complex IV. During 48 hour exposure to DEPC, one of the non-ligating histidines undergoes a Bamberger cleavage and at least 10 non-histidine associated modifications by DEPC occur. These modifications decrease the protein’s pI.

In order to more closely model a modification that could occur in vivo, *TtCuA* was exposed to 4-hydroxynonenal (HNE), an endogenous lipid peroxidation product that is associated with multiple metabolic and neurodegenerative disorders and that is known to modify histidine, lysine, cysteine, and arginine residues. Exposure of *TtCuA* to 20 equivalents of HNE appears to reduce the protein over 48 hours. Less of an effect is seen with fewer equivalents. Modifications of *TtCuA* by HNE have been observed by mass spectrometry. Exposure of the *Pseudomonas aeruginosa* Azurin protein, a mononuclear blue-copper protein that has a redox site nearly identical to *TtCuA* in the denitrification chain, with HNE does not reduce the protein despite modification. *P. aeruginosa* Azurin also does not have a ligating histidine modified by DEPC.

Funding Sources: Trinity University Chemistry Department, Mach Research Fellowship
Root Endophyte Diversity Among Texas Grasses

Sean Cassingham*, Michael Gerick*, Morgan Kopcho*, Michael Leonard*, YINGYING OU*, Kelly G. Lyons, PhD

Endophytes — fungi living within plant roots — are overlooked in research despite their critical role in grassland ecology. These organisms have demonstrated multiple advantages, such as providing their plant host with drought tolerance, nutrient acquisition, and anti-herbivory compounds. Regardless of the fungi’s function, the correlation between symbiont and host association is understudied. As Texas grasslands face increasing pressures from invasive species, human disturbance, and climate change, it is crucial that the relationships between fungal endophytes and their plant hosts are better understood.

In this study, we aimed to identify patterns in the association of fungal morphotypes and OTUs (operational taxonomic units) and compare endophyte diversity between native and invasive grass species. Our research focused on four native grasses, Schizachyrium scoparium (little bluestem), Bothriochloa saccharoides (silver bluestem), Nassella leucotricha (Texas wintergrass), and Aristida purpurea (purple three awn), as well as the invasive Bothriochloa ischaemum (King Ranch bluestem). Root samples from each species were taken from sixteen sites throughout the Edwards Plateau region in Central Texas. Fungal endophytes were cultured from the roots on MEA/antibacterial agar and isolated based on morphotype. DNA samples from the fungal isolates as well as the root samples will also be sequenced. We will present analysis of root endophyte diversity among the grass species based on morphological differences. Evidence that fungal endophytes vary among grass species will enhance our understanding of ecosystem composition and provide wildlife restoration efforts with an indirect means of control. Future studies of competitive dynamics and functional groups can be performed to determine if these endophytes confer a competitive advantage to native grasses against invasion or vice versa.

Funding Source: EcoLab, Hixon, and BSURF
Intraspecific Variation in Sperm and Testis Morphology in Lizards

Isabela R. Carson*, Hannah R. Hall, Ariel F. Kahrl, Michele A. Johnson

The phenomenon of evolution is nearly entirely dependent upon reproduction and variation in reproductive success. The production of functional sperm is a critical component of reproduction, yet we know relatively little about the relationship between testis architecture and sperm morphology. Lizards in the genus Anolis (i.e., anoles) provide an excellent group in which to study spermatogenesis because they exhibit remarkable variation in sperm-related traits among species. A previous study in our lab found that across 18 anole species, larger testes produce sperm with longer heads, and testes with larger lumina produce sperm with longer tails. Yet, it is unclear whether testis and sperm morphologies are related within species. In this study, we examined intraspecific variation in 15-20 males of each of six species of anoles from the Dominican Republic and Puerto Rico. We measured cross-sectional area of testes, seminiferous tubules, and lumina within the testes of cryosectioned testis tissue, and measured sperm head, midpiece, and tail length for each individual. We found that intraspecific correlations between testis architecture and testis size were generally positive, although the significance of these correlations varied between species. Likewise, correlations between testis architecture and sperm measures, as well as testis size and sperm measures, varied widely. These preliminary results demonstrate the complexity of the relationships between fundamental components of reproduction at different taxonomic scales, and suggest that even closely-related species and individuals within a species may vary in the mechanisms of spermatogenesis and tradeoffs made in reproductive strategies.

Funding from Texas Ecolab and National Science Foundation IOS 1257021 to M.A. Johnson
Stress Then Acclimation: Effects of UV Radiation on Kale Growth, Pigmentation, and Antioxidant Content

Madison Semro*, Andrea Nebhut*, Kelly Carroll, Dr. James Shinkle

Kale (*Brassica oleracea var. sabellica*) is a popular and highly nutritious vegetable due to its high antioxidant content. However, kale is often grown in greenhouses or indoor hydroponic farms that do not supplement their crops with the UV radiation that stimulates antioxidant production in a natural light environment by inducing a stress response which includes changes in pigmentation, leaf anatomy, and biomass. The effects of UV supplementation were tested on two varieties of kale to assess the potential benefits and drawbacks of UV treatment on greenhouse-grown kale. After three days of UV-treatment, one of the varieties showed a 29% increase in antioxidant content while the other showed no significant difference. After seven and fourteen days of UV treatment, the UV stress response was characterized through biomass, UV absorbance spectra, UV reflectance spectra, and leaf chlorophyll and flavonoid content. Both varieties of kale displayed a pattern of short-term stress and long-term acclimation: at seven days, UV-treated plants were smaller than untreated plants, had lower UV absorbance and reflectance, and had higher chlorophyll and flavonoid content. At fourteen days, most of these differences were smaller or insignificant. For example, after seven days of UV exposure, the UV-treated Premier kale was 21% smaller than its untreated counterparts, but after fourteen days of exposure, there was no significant difference between the two groups. Therefore, while UV-supplemented plants are initially smaller but more nutritious than unsupplemented plants, these effects lessen after two weeks of consecutive treatment as plants acclimate to UV exposure.

Funding Source: Trinity University Murchison Summer Undergraduate Research Fellowship
Extreme Mass Accretion and Stars

Sofia Rascoe*, Kelli Jackson, Coleman Grisham, Dr. David Pooley

In the process of formation, stars gain mass by accreting it from their surroundings. Some young stars are known to go through a transitory phase of rapid accretion known as an FUor outburst, named after the prototype object FU Orionis. During these outbursts, the stars have the highest mass accretion rates known among star-forming objects. Most models of FUor outbursts employ a greatly enhanced accretion rate from a circumstellar disk onto the stellar surface, increasing from the typical accretion rate by a factor of 10–1000. This type of event could play a large role in setting the conditions for planet formation, but the basic mechanism by which it happens is still unclear. X-ray and optical-IR observations during the burst could be key in understanding these events, but until recently the initial outburst phase had been unobserved in X-rays. Reduction and analysis of Chandra X-ray Observatory data from three different FUor objects is presented. The X-ray spectra are fit with a hot plasma model that takes into account the absorption of photons by intervening gas. We have discovered evidence of an emission line from iron on one of the FUors; the origin of the iron emission is unclear but may lead towards a better fitting understanding of FUor behavior.
**Dopamine Receptor Dependence of Cocaine-Mediated Changes in Connections onto Midbrain Dopamine Neurons**

Aamuktha Karla*, Logan Muzyka*, Christina Guo, Adam Toler, Gerard M. J. Beaudoin, III

Dopamine plays an important role in communication between neurons, notably in the neural pathway that is involved in motivation and reward-seeking behavior. This pathway, called the mesolimbic dopaminergic pathway, is activated by stimulatory inputs, which are affected by a single exposure to cocaine. Our research is characterizing cocaine’s mechanism within one of these inputs by studying the synapses between the midbrain regions pedunculopontine tegmental nucleus (PPN) and substantia nigra pars compacta (SNc). Prior research has shown that cocaine induces changes in receptor composition at synapses between glutamatergic neurons in PPN and dopaminergic neurons in SNc. The ratio between two glutamate receptors, NMDA and AMPA, is used to assess this synaptic plasticity in response to *in vivo* cocaine exposure in mice. A virus encoding a fluorescent protein (YFP) and a light-operated cation channel (ChR2) is injected via stereotaxic surgery, allowing us to selectively excite PPN-innervated synapses on SNc dopamine neurons. Using electrophysiological recordings, 24 hours after *in vivo* cocaine exposure causes a decrease in the AMPA to NMDA receptor ratio. It is unknown, however, whether excitatory D1-like or inhibitory D2-like receptors are involved in this change. We are investigating the effect of a D1-like receptor antagonist (SCH 23390) and D2-like receptor antagonist (eticlopride) on the cocaine-induced decrease in the AMPA/NMDA ratio. Based on cocaine’s established role in inhibiting the dopamine transporter, we suspect that one or both of these receptors are required. Preliminary evidence suggests that D1 receptors are involved in cocaine-mediated plasticity of PPN-SNc synapses.

Funding Sources: Mindlin Foundation Undergraduate Mentored Research Grant, Murchison Summer Undergraduate Fellowship, Biology Summer Undergraduate Research Fellowship, Trinity Start-Up Funds
Investigating the Role Of the Lipid Phosphatase Fig4's Active Site In Direct Regulation Of Protein Partners

Hannah Reeves*, Sora Lee, Jason MacGurn, Lois Weisman, Bethany Strunk

Fig4 is a phosphatase which means that Fig4 removes phosphate groups. Phosphate groups control the structure and function of many organic macro-molecules. Fig4 dephosphorylates a specific lipid: PI3,5P2. However, it is now understood that Fig4 also plays an important role in the direct influence of protein function. Additionally, Fig4 is required for the production of its lipid substrate because it binds and stabilizes the protein complex holding its opposing kinase, Fab1. Mutations in Fig4 that have been associated with neurodegenerative diseases lead to defects in Fig4 association with Fab1. Surprisingly, a catalytically dead mutation of Fig4 results in tighter association with Fab1. We suspect that Fig4 may be acting as a protein phosphatase, in addition to its lipid phosphatase function, and that this protein phosphatase activity may regulate Fig4 association with Fab1. We hypothesize that the C467S mutation may cause the active site to become “stuck” on protein substrates when it is attempting to dephosphorylate them, and this is causing the tighter binding to Fab1. Consistent with Fig4 functioning as a protein phosphatase, we have identified phosphorylation sites on the C-terminal tail of Fig4 and in Fab1 that are elevated when Fig4 is mutated to be catalytically dead. Tight binding could result either from the active site being directly stuck to Fab1 or because of a change in conformation if Fig4 is stuck to itself. I have created Fig4 mutants where the phosphorylation sites we identified on the C-terminal tail have been changed to alanines, which can’t be phosphorylated. I will use these mutants as well as similar mutants with the phosphorylation sites identified in Fab1, to test if these phosphorylation sites influence association with Fab1 through immunoprecipitation.

Funding Source: Trinity University Biology Department
Investigating the Molecular Interactions of the Human Tumor Suppressor PTEN Using its Homolog TEP1 in the *S. cerevisiae* Model

Isabella Rizzo*, Bethany Strunk, PhD.

The human tumor suppressor gene PTEN (phosphatase and tensin homologue deleted on chromosome 10) encodes a phosphatase that reduces the levels of PtdIns(3,4,5)P3, a signalling lipid that promotes cell proliferation and suppress apoptosis. The loss of wild-type PTEN is observed in most sporadic cancers as well as autosomal dominant cancer predisposition syndromes. In addition to reducing levels of PI(3,4,5)P3, it has become clear that PTEN also influences cell growth independent of its activity on PI(3,4,5)P3, through direct interactions with other proteins. PTEN’s protein-protein interactions are numerous, however, their implications are not fully understood. Whether the conformational changes of PTEN act as a switch responsible triggers the activation of other mechanisms is also unknown. We are using the yeast species *S. cerevisiae*, to study the potential conserved protein-protein interactions of the PTEN homologue, TEP1, and the regulation and function of these interactions in yeast cells. We deleted Tep1 from *S. cerevisiae* by homologous recombination. This strain will be used as our background strain to allow detection of direct interactions with protein partners by expressing Tep1 proteins tagged with affinity or fluorescent tags. We identify protein interactions and how these interactions change depending on environmental conditions and Tep1 phosphatase activity.

The name of the source or sources of research funding: NIH

Funding Source: Mellon Initiative
Studying the human tumor suppressor PTEN through the lenses of protein interactions and cellular localization of its yeast homolog, Tep1.

Madeleine Heliste*, Dr. Bethany Strunk

PTEN is classified as a tumor suppressor as mutations to PTEN increase the risk of tumor development. It functions as a lipid phosphatase, a protein phosphatase, and both regulates and is regulated by protein targets through protein interactions. Much knowledge of PTEN’s tumor suppressive activity is focused on its lipid phosphatase function, but its protein-protein interactions have been shown to play an important part as well. Previous data suggests that activation related conformational changes of PTEN, exposing or concealing the active site, may influence changes in these protein-protein interactions. Saccharomyces cerevisiae, also known as baker’s yeast, has a PTEN homolog, Tep1, whose function is currently unknown. Additionally, the human PTEN lipid substrate, PI(3,4,5)P3, is not detected in S. cerevisiae. We are testing the model that potential conserved functions between Tep1 and PTEN may involve direct regulation of protein partners. We generated Tep1 reagents with affinity tags or fluorescent tags which will allow us to monitor changes in protein interactions in response to changes in catalytic function and external environment. Analyzing the nature and dynamics of Tep1’s protein interactions and localization within the cell may provide insight into the significance of PTEN’s conformation and protein interactions in its tumor suppressor activity.

Funding Source: NIH
Changes in Connections Between Neurons Induced by Cocaine

Sierra Rodriguez*, Juan Felipe Moreno*, Kate Windsor, Adam Toler, Parker Voit, Adam Litch, Aamuktha Karla, Christina Guo, Logan Muzyka, Sarosha Hemani, Gerard M. Beaudoin, III

In vivo cocaine exposure has been shown to induce changes in excitatory synaptic responses to nigrostriatal dopamine neurons. These neurons may be a part of the reward pathway and could be important for controlling motivation and addictive behavior. In early work, cocaine was shown to initially change excitatory synapses on dopaminergic neurons without identification of the source of the glutamate. Using optogenetics, we are able to label and activate PPN by injecting in mice a virus encoding a light operated cation channel, channelrhodopsin (ChR2), and yellow fluorescent protein (YFP). Using this system, we have shown that glutamatergic projections from the pedunculopontine tegmental nucleus (PPN) onto dopamine neurons in the substantia nigra pars compacta (SNc) have altered glutamatergic receptor ratios one day after a single injection of cocaine administered in vivo. Specifically, the PPN-SNc synapse has an increase in N-methyl-d-aspartate (NMDA) receptor function, as tested using electrophysiology. We are now further characterizing the underlying structural and functional changes at this synapse that underlies this increase in NMDA receptor-mediated currents. We are using a combination of electrophysiology and immunofluorescence with confocal imaging to ascertain if the increased NMDA receptor-mediated current is due to one of several hypotheses including, but not limited to, an increase in the number of synapses, an increase in the number of NMDA receptors at the same synapse, a change in localization of receptors at the synapse and/or a change in subunit composition. Thus, we have begun to characterize the postsynaptic responses of SNc dopamine neurons to excitatory projections from PPN to identify the receptor subunit composition at these glutamatergic subtypes. As expected, NMDA receptors (NMDARs), have a typical, outward rectifying I-V relationship suggesting the presence of standard NMDAR1/2 heteromers. Additionally, distribution of NMDAR1 subunit localization is not globally affected by cocaine in SNc. We are using the YFP-labeled PPN axons to identify changes in localization of glutamatergic subunits at these synapses on dopamine neurons. We have developed an automated image analysis routine to identify putative synapses between PPN and dopamine neurons from confocal images in order to assay changes in localization, size, and quantity of specific glutamate receptor subunits. By measuring the synaptic response of dopamine neurons and imaging localization of NMDA receptors to putative synapses, we are able to identify what is affected by cocaine at these synapses.

Funding Source: Biology Summer Undergraduate Research Fellowship (BSURF), Trinity Start-Up funds
Moving Voting Rights Forward

Travis Boyd, David Crockett

I have been working in the office of MOVE Texas as an Advocacy Fellow. My principal role has been to help push campaigns from the drawing board to the real world. We have been registering voters in disadvantaged communities in San Antonio, as well as changing the laws surrounding voting rights to ensure everyone has access to the ballot. My role in that has included designing educational presentations, researching local voting laws, and organizing information in spreadsheets.

Funding Source: MAS
RAICES: The Refugee Center for Education and Legal Services

Morgan Carr, Dr. Katsuo Nishikawa

This summer I was an intern at the nonprofit RAICES and worked in their volunteer operations department. During my time here, I provided the volunteer staff support by creating a system with which to organize and receive donations. I want my career to lead in the direction of human rights and working for this organization provided me with some clarity on how I want to achieve this goal.
Effects of Pharmacotherapeutic Intervention on Contextual Fear

Victoria Stringer*, Dr. Kah-Chung Leong

Fear is an advantageous evolutionary mechanism but maladaptation of this process can often lead to detrimental behaviors/disorders. Fear memories can be measured through a contextual fear conditioning model in which a specific context is paired with an aversive stimulus (i.e. foot-shock). This serves as an animal model to measure processes underlying fear memory and fear-related disorders in humans. Importantly, pharmacologic compounds can also be tested in this paradigm to identify possible therapeutic targets for treatment of fear-related disorders. Previous studies have shown the neuropeptide oxytocin to have an anxiolytic effect, while another compound, propranolol, also reduces symptoms of anxiety. Therefore, the overall goal of this study is to examine the potential therapeutic effect of these compounds in disrupting the formation or expression of fear memories. In this study, we contextually fear conditioned animals and examined the effects of oxytocin and propranolol in an effort to disrupt contextual fear memories. Specifically, adult male Sprague-Dawley rats were placed into a context for 20 minutes in which they received intermittent foot-shocks (7 shocks/day; 1 mA each) across 2 days. On day 3, rats were fear tested. During the fear test, rats were returned to the same context in which they were previously shocked and activity levels were measured in the absence of any shocks. A loss of activity is used as a measure of fear memory associated with the context. In experiment 1, we tested the neuropeptide oxytocin and its ability to disrupt the acquisition or expression of contextual fear memory. Rats were administered oxytocin (1 mg/kg; i.p.) 30 minutes before fear conditioning (days 1 and 2) or 30 minutes before fear test (day 3). In experiment 2, we tested the beta-blocker propranolol’s ability to disrupt acquisition or expression of contextual fear memory. Similar to experiment 1, rats were administered propranolol (3 mg/kg; i.p.) immediately prior to fear conditioning (days 1 and 2) or fear test (day 3). Overall, we found that propranolol was ineffective in disrupting the acquisition or expression of contextual fear. Additionally, we examined the specific neural regions (e.g. central amygdala) underlying the disruptive effect of oxytocin on contextual fear memories. Overall, these results have potential implications for understanding PTSD and other fear-related disorders.

Funding Source: Murchison Summer Research Fellowship (VS)
Effect of Alcohol Administration on Relative Use of Multiple Memory Systems

Devon Patel*, Dr. Kah-Chung Leong, Ph.D.

The mammalian brain consists of multiple memory systems mediated by independent neural structures. Two main memory systems are the hippocampus-dependent spatial memory system and dorsal striatum-dependent habit memory system. Various factors influence the relative use and effectiveness of these memory systems, but the specific role of various drugs of abuse on these memory systems has yet to be fully elucidated. Several studies have suggested that acute alcohol exposure disrupts hippocampus neurophysiology and impairs neural function. We postulate that this impairment of hippocampal neural function would lead to significant behavioral disruption of hippocampus-dependent spatial learning and memory. In this study, we tested the specific role of acute alcohol administration on hippocampus-dependent memory through the use of a spatial water plus-maze task. We first examined the effect of alcohol administration on the acquisition of a hippocampus-dependent task, the forced-place single-solution water plus-maze paradigm. Animals were challenged with an ethanol injection (10% v/v, 1.5 g/kg, i.p.) or saline control 30 minutes prior to training for four days and did not receive an injection on the fifth day. Acute alcohol administration significantly impaired acquisition of a hippocampus-dependent single-solution water maze task. Results from this study demonstrate alcohol administration impairs spatial learning and these impairments persist even in the absence of subsequent alcohol exposure. Future studies should be conducted to determine the specific neural mechanisms through which alcohol produces hippocampus-dependent learning impairment.

Funding Source: Murchison Summer Undergraduate Research Fellowship (DP)
Beluga Kissing: Context for the Mouth Game in Beluga Development

Ángel Velarde*, Jesús Miranda, Heather Hill, PhD

Play behavior in cetaceans is among the most complex behaviors described in beluga research. Play might reflect development or survival skills (Hill, Dietrich, & Cappiello, 2017). The mouth game, a type of cooperative play behavior, consists of two belugas putting mouths together and pulling in opposite directions (Hill, Dietrich, Guarino, Banda & Lacy, 2018). The current study utilized observations of belugas housed at SeaWorld San Antonio to investigate if the mouth game is affected by variables such as preceding social interaction or environments. Data were collected from 28 coded videos of 16 belugas (eleven females) with access to different combinations of eight different pools, recorded between 2007 and 2016. Results suggested precursor behaviors primarily included affiliative interactions and social swims. The amount of space available did not affect the frequency of the mouth game behavior. Future research must investigate the habitat in which belugas spent more time and the companion animals that were present. Environmental influences and influence of preceding social interactions may provide insight into the development and utility of the mouth game in belugas.

Funding Source: St. Mary’s University, Office of Student Research and Inquiry
Effects of Anxiety on Sucrose-associated Place Preference

Rodrigo Castillo*, Kah-Chung Leong PhD

Conditioned place preference is a paradigm used to measure an organism’s association of reward with contextual cues, such as the environment in which it experiences reward. Following the experience of reward in a particular environment, organisms develop a preference for the reward-associated context. This is reflected in everyday life, where people tend to spend more time at their favorite gym, coffee shop, restaurant, or any place that has previously been associated with a rewarding experience. However, emotional factors such as anxiety can disrupt this context-reward association. Following periods of increased anxiety, individuals tend to spend less time at the places they once loved to go and participate in fewer activities they once enjoyed, an effect known as anhedonia. In other words, anxiety can diminish the association of contextual reward. Here, we model this effect of anxiety-induced anhedonia using the anxiogenic drug, yohimbine, to impair sucrose conditioned place-preference in rats. In this study, sucrose reward was paired with a particular context via a conditioned place preference paradigm. Specifically, adult male Sprague-Dawley rats underwent a series of conditioning sessions to associate sucrose pellets with a naturally aversive white compartment and sucrose place preference was established. Place preference was tested by comparing the sucrose-paired rats’ time spent in the reward-paired compartment against the control rats when allowed to roam freely between two compartments. When rats were administered the anxiogenic drug, yohimbine (2.0 mg/kg, i.p.), before testing sucrose place preference was abolished, suggesting that anxiety produced an anhedonic effect. We subsequently attempted to block the effect of anxiety on sucrose conditioned place preference through administration of two potential therapeutic targets, oxytocin and propranolol. Research has shown oxytocin, a neuropeptide implicated in social bonding, childbirth, and affection, also possesses potent anxiolytic properties. Propranolol has been used to treat the peripheral symptoms of anxiety (increased heart rate and sweating), which may reduce overall anxiety. Administration of oxytocin (1.0 mg/kg, i.p.) or propranolol (3.0 mg/kg, i.p.) concurrent with yohimbine before testing did not rescue sucrose conditioned place preference. Overall, this study revealed that anxiety was sufficient in disrupting sucrose place preference, an effect modeling anxiety-induced anhedonia, while oxytocin and propranolol were unable to re-establish place preference. These results warrant further research on stress-reward brain pathways to determine a viable therapeutic target in disrupting anxiety-induced anhedonia.

Funding Source: Murchison Summer Research Undergraduate Fellowship (RC)
Anxiety Maladaptively Enhances Sugar-Seeking Behavior

Kylee Bieri*, Alyssa Avalos, Kah-Chung Leong, PhD

The World Health Organization (WHO) estimated that 1.9 billion adults were overweight in 2016, with 650 million of these adults suffering from obesity worldwide. While several factors play a role in the development of obesity, increased consumption of sugar has been heavily linked to an increased risk of obesity across multiple age groups. The purpose of this study is to determine how emotional factors, such as anxiety, can influence the desire to seek out sugar reward in a self-administration model of reward-seeking behavior in rats. Furthermore, we examined the ability of a potential therapeutic target, the neuropeptide oxytocin, to block the effect that anxiety has on sugar-seeking behavior. In this study, rats were trained to self-administer sucrose, in which a single press of an active lever resulted in delivery of a single sugar pellet concurrent with presentation of a cue+light complex stimulus. After acquisition of self-administration was complete, rats underwent extinction in which lever presses no longer resulted in any scheduled consequence. Following extinction, rats were reinstated through administration of an anxiety-inducing a2 adrenergic receptor antagonist, yohimbine (2.0 mg/kg; i.p.). In one group of rats, oxytocin (1.0 mg/kg; i.p) was also administered alongside yohimbine. Preliminary results suggest that anxiety successfully reinstates sugar-seeking behavior, while oxytocin successfully blocked the effect of yohimbine. This implicates a possible use of oxytocin to decrease the deleterious effect that anxiety has on sugar-seeking behaviors. Although “sugar addiction” is not formally recognized as a substance use disorder, the rodent self-administration/reinstatement model of reward-seeking behavior is often used as a model of addiction related behaviors as it imitates various stages of the addiction cycle in humans, suggesting that the behavioral characteristics of sugar-seeking behavior mirrors that of established substances of abuse.

Funding Source: Murchison Summer Undergraduate Research Fellowship (KB)
Recreating Primary Source Data for the Ancient Jewish Village of Khirbet Shema

Adam Toler* and Chad Spigel, Ph.D.

From 1970 through 1972, Duke University sponsored the archaeological excavations of Khirbet Shema – an ancient Jewish village in the Upper Galilee region of modern-day Israel. The results of this excavation have already been “published” using the common archaeological practice of summarizing the archaeological data and providing an interpretation of the data in a printed book. While this approach has been standard for over a century, it has significant shortcomings. Whereas the archaeologists who excavated these sites had access to the actual archaeological evidence (i.e. the dirt and artifacts as they were excavated), as well as thousands of documents created to represent the physical evidence they destroyed as part of the excavation process, the print publications only include the subset of data determined to be relevant by the excavators. In order to provide scholars with access to the primary source evidence that was not included in the print publications, the Duke University Galilee (D.U.G.) Database team is working on the development of an open-source archive that will provide scholars with access to the archaeological data used by the excavators themselves to write their reports and form their interpretations, but which did not make it into the final print publication.

In this presentation, I will discuss the semantics of primary versus secondary source data and explain why and how we are creating the open-source archive. The process of creating the archive includes identifying the archaeologically relevant materials, creating meaningful metadata, and organizing the archive so scholars can effectively use the documents to contribute to ongoing debates about the chronology and use of the ancient village’s synagogue building. The implications of this project are far-reaching, as digital archives tend to reinvigorate scholarship through increased ease of accessibility. In addition, an open-access digital archive with these types of archaeological data has never been produced, allowing the D.U.G. Database to act as a model for other research groups, facilitating the transition of archaeological studies into the modern, technological era.
A Westside Story: Esperanza en el Barrio

Thomás A. Peña, Dr. Angela Tarango

Based in the Westside of San Antonio, the Esperanza Peace & Justice Center works in advocacy to protect the vibrant culture of San Antonio. It does so by challenging unjust legislation and establishing commonalities among communities which are facing heightened pressure from the rapid urban development. The Esperanza Peace & Justice Center prides itself not only for creating an inclusive environment, but taking ownership of their space, holistic community building, Mestizaje identity, and art activism. As an intern at the Esperanza Center this summer, I expected to focus on work that encompassed my academic interests. However, I encountered work that requires not only intellectual grit but also inmost heart. Through my time here, I have had the pleasure of building relationships with prominent social activist figures in San Antonio that stand for equality across all genders, races, sexual orientations, social classes, and all other factors that creates our individualized human experience.

Funding Source: Alvarez Internship Grant
Activating Archives: Maintaining, Exhibiting, and Publishing the Exhibition History of Blue Star Contemporary

Stephen Sumrall-Orsak*, Kate Ritson

The Arts Letters and Enterprise (ALE) internship program granted me the opportunity to complete an internship with Blue Star Contemporary (BSC). ALE internships give students an opportunity to gain work experience in different industries including: business, arts, science, technology, non-profit and government industries with the intent of growing and broadening students’ skills. My internship at BSC has allowed me to merge my knowledge and ambitions as an Art Major into a practical non-profit museum setting.

My time at BSC has given me experience in a wide range of fields including: project management, information literacy, design, and archiving practices. Working under the umbrella of archives I have had the opportunity to work on projects such as the New York Foundation of the Arts (NYFA) Immigrants Artist Mentoring Program Exhibition at Centro de Artes, the Berlin Catalogue and digitization and the ongoing archiving of BSC’s exhibition materials from 1986 to today. Each of these projects posed unique challenges, requiring problem-solving ranging from digital literacy to software familiarity to research to design. For example, the NYFA display required project management skills in monitoring costs, sourcing of materials, project proposal, install and pricing out of options. Design skills were needed to create the layout and choose materials. Informational literacy was required to select relevant images from the BSC archives. The result was a project that both conveyed the mission of BSC, but also engaged the public by bringing the archives to life. My internship experience with BSC has granted me an understanding of how to handle a project from start to finish, in addition to an appreciation of the time, skill, and effort needed to run a non-profit such as BSC. My poster will further explore my experience at BSC.

Funding Source: Arts Letters, and Enterprise Program
ALE Summer Internship: An Introduction to the Texas Art Scene through Ruiz-Healy Art

Kristina Reinis*, Kate Ritson

This summer, I completed an internship at Ruiz-Healy Art Gallery. This internship was provided through Trinity’s Arts, Letters, and Enterprises program and it gave me a way to apply both my English and Studio Art majors in practical and engaging way. My position at Ruiz-Healy Art gallery introduced me to the inner-workings of a private gallery. Working with a small team, I was able to get hands on experience with all facets of the private gallery business. My main responsibility was to revamp their blog in which I interviewed eight artists, transcribed those interviews, and published the completed interviews on their website. I also helped organize their archives, and more specifically, I did research for the Chuck Ramirez Estate which Ruiz-Healy Art represents. Furthermore, I planned and posted the gallery’s social media posts on Facebook, Twitter, and Instagram. Through these tasks, I was able to perfectly utilize the skills I have learned from my English and Studio Art majors. From writing, to research, to archiving, and to daily tasks at the gallery, my internship at Ruiz-Healy Art introduced me to what it means to work within this industry.

Funding Source: The Arts, Letters, and Enterprise (ALE) Internship Program
Women Worth Watching: A Comparative Study of Internet Parody

Ry Eskridge*, Dr. Jie Zhang

The project focuses on how the cyberspace has emotionally engaged parts of Chinese society—the state, the burgeoning middle class, the stratified netizens, and the youth—in shaping public discourses and forging subcultures in a post-socialist setting. We examine how people’s “old” emotions—happiness, sadness, disgust, fear, surprise—are expressed, consumed, and mobilized through “new” media. Through this study we hope to help understand the cultural ramifications of the internet, revealing the affective fabric of digital culture that has yet to be closely studied.

Specifically, my poster presentation analyzes the rise of Papi Jiang’s parodic videos since 2016 in a comparative context. Papi’s videos, which she originally posted on China’s popular Weibo platform, playfully portray her life and her inner thoughts. Lilly Singh (also known as IISuperwomanII), one of the top-earning content creators on YouTube, makes videos which include her personas of her parents, family members, and other people in humorous scenarios, usually showcasing her take on a situation given her parents’ Indian culture. Papi and Singh’s videos both parody people and situations they and their viewers encounter in their daily lives, though through different cultural lenses. In this project, I hope to uncover the ways that parody manifests on the Chinese Internet versus the Western Internet.

Funding Source: Mellon Initiative
Poll Taxes and Chili Queens: Mayor Maury Maverick, and Civil Liberties in Pre-War San Antonio

Cornelia Laing*, Dr. Jennifer Henderson

From 1939-1941 Maury Maverick Sr. was mayor of San Antonio, winning a contentious election against incumbent mayor and machine boss Mayor C. K. Quin. The two years he served in office would see him have several interactions with women’s groups around San Antonio, these interactions intersected with civil liberties and issues pertaining to discrimination. Maverick’s interactions with women’s groups led to him being indicted for poll tax fraud and oversee his own chili stand.

Maverick was accused and later acquitted of paying the poll tax of members of the International Ladies’ Garment Workers’ Union (ILGWU), a federal crime. Maverick was ardently against poll taxes, and saw them as an infringement on civil liberties. However, his contribution to the union, allegedly to pay the poll taxes of ILGWU members, was seen by many as "buying votes." He brought back the Chili Queens, Mexican-American women who ran food stands in Haymarket Plaza from 1880’s until Mayor Quin shut them down in 1937. He created his own model stand to display how health regulation should be followed. Maverick’s health department, with harsh restrictions imposed on the Queens, along with him losing his re-election campaign saw the stands be shut down once again when Quin was re-elected. Conducting primary research through newspaper archives, textual evidence from accounts of the time, and Maverick’s own speeches, memos, notes, and scrapbooks, a more detailed account of his time in office in regards to actions taken towards women’s civil liberties during this period has been created.

Funding Source: Mellon Initiative
The Socio-Cultural Experiences of Mexican-American Recent High School Graduates

Chelsea Rodriguez*, Dr. Rocío Delgado

In the summer of 2019, I followed a qualitative research approach and interviewed 4 Mexican-American, recently graduated high school students matriculating to college. The research questions guiding this inquiry were aimed to identify aspects of the education system that participants perceive to affect their interest in school the most. As discussed by Valenzuela 1999, U.S born Mexican-American students experience the U.S. education system more negatively than do other their nationally born counterparts. To continue to explore reasons why U.S. born Mexican-American students continue to encounter negative experiences in the education system, this study focused on determining what cultural difference either hinder or support U.S.-Born Mexican-American students in their educational experience. Interview questions focused primarily on aspects of biculturalism that Mexican-American students encountered and which helped them engage or disengage with school. Interview questions also inquired about which relations, either with family, peers, or teachers encouraged students to participate in school. The main purpose in inquiring about these cultural differences is to determine what agency U.S.-born Mexican-American students feel they possess in relation to their status as bicultural participants of U.S. society. Interviews also highlight student’s experiences with civic education, if any at all. In order to determine how confident students feel about advocating for a more relevant, bicultural education, this research begins with understanding how students feel primarily as Mexican-American U.S.-born students in the U.S. education system.

Funding Source: McNair Scholars Program
“Negotiating Place” in the Workplace

Robin Bissett*, Michael Soto

This summer, I worked for San Antonio’s literary arts center, Gemini Ink, as the Writers Conference Marketing Intern. My primary objective was to spread the word of the Fourth Annual Writers Conference as far as possible and to generate excitement in the Central Texas literary community and beyond. To accomplish this, I worked alongside the Marketing Manager and Marketing Assistant to design the official Conference poster and multiple event flyers, and to create and post original content on various social media platforms. As a rising senior English major and Creative Writing minor, my ALE internship with Gemini Ink afforded me the opportunity to apply my skills in written communication and to achieve my dream of working beside nationally recognized creative writers.

During my time at Gemini Ink, I honed my eye for graphic design, gained more experience in writing short but engaging copy in online posts, and became close to other members of the Gemini Ink staff as we all worked to showcase this year’s Conference theme: Negotiating Place. In San Antonio, a city of diverse voices, Gemini Ink sits at a crucial intersection between a place and its people.
Behind Conference Behind-the-Scenes

Joshua Gain*, Dr. Michael Soto

My internship with Gemini Ink, a nonprofit literary arts center, provided by the Arts, Letters, and Enterprise internship program, allowed me to get real-world experience as part of a conference planning team. Conference logistics is all about looking at the long-term rewards of your work and waiting for the culmination that is the writers conference. My workload followed a curving path over the course of the summer. I only had one task that stayed consistent throughout the process.

Much of what I was working on did not bear any fruit until approximately two weeks before the conference, six weeks into the job. But this internship provided me countless opportunities to meet and interact with important individuals from associated businesses, such as the Director of Convention Services at the El Tropicano Riverwalk Hotel. It also helped me get comfortable collaborating with others on a small-scale level. All of the skills I’ve learned through my work with Gemini Ink, whether it was coordinating with executives of partner organizations or collaborating with members of has helped prepare me for my future career in game development since I will regularly be arranging conferences in that position, as well.

Funding Source: Arts, Letters, and Enterprises Minor
The Prickly Pear Doesn’t Fall Far From the Cactus: A Summer at Green Spaces Alliance

Amani Canada*, Dr. Kelly Grey Carlisle, and Dr. Carl Leafstedt

After years of professional development, I was fortunate enough to engage in the Arts, Letters, and Enterprise internship program. This internship program is geared towards enriching students in the humanities and sciences with a learning experience in the business or non-profit world. I spent this summer with Green Spaces Alliance, a non-profit urban land trust with three programs: Land conservation, Urban Land and Water, and Picture Your World. As the Urban Land and Water intern, I worked closely with the program manager in order to coordinate our community garden network of twenty-two active gardens funded by the City of San Antonio’s Parks and Recreation Department. I have worked hand-in-hand with garden stewards across San Antonio to fund garden renovation projects, start new gardens, and sustain existing gardens. I have also created water education workshops to fulfill our commitment with the San Antonio Water System and educate San Antonio citizens about the benefits of water conservation and techniques. Additionally, I have cultivated my skills in grant writing and evaluation, customer service and professionalism, adaptability, land monitoring, and negotiation.

While interning at Green Spaces Alliance, I was tasked with creating a Demonstration Garden in the office’s backyard. The purpose of this garden is to educate about water saver and catchment options, native and pollinator plant gardening, companion plant planting, and many more methods to have a sustainable yet beautiful garden. I knew nothing about gardening, but I used my academic skills in researching to plan the layout, choose plants and placement, create areas of interest, Photoshop renderings of the garden, and ultimately present them to my company. Once the planning phase was over, I was able to enact my plans and physically bring my garden to life through organization of volunteers and workshop creation. After this internship, I will be walking away with new and improved skills and a better understanding of the environmental non-profit world to supplement what I have learned in double majoring with Environmental Studies and Earth Systems Science.

Funding Source: Arts, Letters, and Enterprise Program
**SAY Sí and Me: An Introduction to the Art Side**

**Bella Peters*, Dr. Erin Hood**

The Arts, Letters, and Enterprise (ALE) Summer Internship program helped me to partner with SAY Sí, an art non-profit in the King William’s district of San Antonio. The program offers tuition free arts programming to middle and high school students from across the city. Students and staff come from a variety of artistic, economic, and cultural backgrounds to work on raising funds, helping students thrive, and keeping the organization running smoothly.

While at SAY Sí, my main task was to be a development assistant, but I also ended up working closely with the Executive Director. I learned the ins and outs of working with donors, Salesforce, Click & Pledge, and a variety of other platforms donation and organizational platforms. I quickly adjusted to the variety of ways to contact individuals and how to professionally format print or digital media being released to donors. I not only assisted in the development field but helped schedule meetings with city council, learned how exhibits are put up and taken down, and even worked with students to help them write resumes. I improved my digital literacy skills necessary to work in the non-profit world and had my eyes opened to the arts community in San Antonio that I knew little about.

Funding Source: Arts, Letters, and Enterprise Minor
This summer, I had the privilege of completing an internship at San Antonio Clubhouse, a non-profit organization that serves adults with mental illnesses. At Clubhouse, members can acquire new skills, seek employment, enhance their education, and establish a supportive community. This internship was provided through Trinity’s Arts, Letters, and Enterprises program. My primary role was to develop a comprehensive wellness program to compliment the arrival of Project HUG, a Hydroponic Urban Garden made possible with funding from Impact SA. Working at this organization has allowed me to hone various skills that will be valuable to me both professionally and personally. My poster will examine these skills and showcase the framework of the wellness program I have designed.

Perhaps the most important skill that I have developed is interpersonal communication. By immersing myself into the community as I worked with members, I was able to learn how to communicate more effectively both in different situations and with people different from myself. I was also able to develop my strategic thinking skills as I was tasked with accessing the wellness needs of the community. After gaining insight into those needs, I was able to strengthen my problem-solving skills by creating a solution to those problems. Finally, I gained the ability to understand the non-profit field and the non-traditional ways of running an organization outside of the government and private sector.

Funding Source: Arts, Letters, and Enterprises Internship
Creating a Better San Antonio with Nonprofit News

Jenna Ashworth, Dr. Erin Hood

Trinity’s Arts, Letters, and Enterprise program allowed me the privilege of working at the Rivard Report as a marketing and audience engagement intern this summer. The Rivard Report serves as a local nonprofit news source with the goal of fostering a well-connected and engaged community with its news and commentary. I applied my studies in Marketing and English in order to assist the business team with marketing efforts, audience engagement events, and strategic advertising implementation.

At the beginning of the summer, one of the goals I made in my learning agreement was to become more familiar with the array of software used in marketing. A main objective of my audience engagement role was to use Parsley, Quantcast, and Google Analytics to identify the current demographics of the Rivard Report’s readers in San Antonio. Then I had to identify the potential readers not yet engaged by looking at census data. In addition to this, I was given access to Google Ad Manager where I was able to manage $10,000 worth of google ads granted to the Rivard Report monthly through the Google Ad Grant for nonprofit organizations. As an intern, I have learned how to create advertising reports and engage people with written and verbal correspondence in order to satisfy marketing efforts. This experience has given me a better understanding of the work environment and career path that I want to pursue after graduation.

Funding Source: Arts, Letters & Enterprise
Developing Relationships With the San Antonio Symphony

Sarah Thompson*, Dr. Diane Persellin

I had the wonderful opportunity to be the Development Intern at the San Antonio Symphony. This internship was coordinated through the Arts, Letters, and Enterprise program at Trinity University. In my role at the Symphony, I was able to get hands-on experience in a non-profit arts organization, which is a career path I wish to pursue. I learned about the importance of developing relationships through oral communication and written language. This poster shows the skills I have gained during my 10 weeks working with the Symphony.

As the Development Intern, I spent my time practicing professionalism through face to face interaction with donors. I assisted with receptions, at special group nights, at concerts, and at a Symphony Gala this summer. In the Symphony office, I increased my technical and organizational skills. I helped track donations to the San Antonio Symphony using the Raiser’s Edge program and through filing hard copies. My Excel skills were minimal at the start, but I am now more confident as I have regularly worked with the program. Though my work varied, the end goal was to continue to foster relationships among the Symphony administration, the public, and Symphony musicians. The professional relationships and skills I have built during my internship will stay with me as I continue my professional development.

Funding Source: Arts, Letters, and Enterprise Minor
Redirecting Skills: 
ALE Internship at The Classic Theatre of San Antonio

Kathleen Arbogast*, Dr. Stacey Connelly

The Arts, Letters, and Enterprise Summer Internship program at Trinity University offers science and humanities majors the opportunity to gain and improve their business literacy and transferable skills while working for local reputable organizations. As a Religion major and Theatre minor interested in the non-profit sector, I had the privilege of interning with The Classic Theatre of San Antonio, a small professional non-profit theatre in the Deco District. This welcoming yet fast-paced environment created the perfect opportunity to improve my marketable skills and self-sufficiency.

During my internship, I set goals and learning objectives every couple of weeks to guide my efforts. In my position at The Classic Theatre of San Antonio, I completed a number of projects including creating an inventory database for props and costumes, communicating with contracted artists, setting up a volunteer system, and day-to-day operational tasks. These assignments, among others, developed my creativity, oral and written communication skills, and problem-solving skills. They also gave me a newfound yet strong interest in operational management. I learned the ins and outs of non-profit work and the value of my own skill set, successfully preparing me to enter the professional workforce.

Funding Source: Arts, Letters, and Enterprises Program
Cultural Relevance in Dual Language Classrooms

Isabel Chávez*, Dr. Rocio Delgado

During my internship experience at Lamar Elementary’s dual language classrooms and with Dr. Delgado’s children’s books collection, I analyzed the larger role that children’s literature plays in the development of students’ understanding of language and culture. Books affect the ways in which children learn about the world and society at large, making it critical that the literature available in schools represents the diverse student population found in U.S. classrooms. My assistance in organizing and analyzing children’s books will help identify diverse topics and titles to be added to the collection.

Funding Source: MAS Alvarez Internship Grant
Disparities in Well-Women care in Bexar County

Diana Long, Dr. Sosnaud

The following presentation focuses on the disparities of well-woman care in Bexar county. This information stems from my internship experience at the San Antonio Metropolitan’s Healthy Start Program. Healthy Start offers the nation’s most vulnerable women and families high quality services and resources for healthy pregnancies and healthy births. Their goals are to minimize barriers and gaps in structures that do not support positive birth outcomes through home visitations and health education as well as conduct PPOR (Perinatal Periods of Risk) Analysis and other data collection and analysis activities to support and inform the program and community interventions. One particular intervention is assuring that women receive quality well-woman care. Well-Woman care is a main factor that promotes positive birth outcomes. If a woman has superb preconception health, her chances of experiencing a high-risk pregnancy are minimal. However, Bexar county faces a pertinent public health issue with its high infant and mortality rates and low life expectancies. Healthy Start looks forward to implementing new strategies to increase the amount of women who partake in preconception health practices, such as well-woman exams, with the vision of making sure all babies in the San Antonio area have an equal chance to live and thrive.
**Synthesis and Fabrication of Norbornene-Thiol Polyethylene Glycol Based Hydrogels as Cytocompatible Scaffolds for the 3D Culture of Glial Cells**

**Margherita Contestabili**, Dany J. Munoz Pinto Ph.D., Andrea Jimenez Vergara Ph.D.

The *in vitro* study of neurodegenerative diseases, including Alzheimer's disease, is largely limited by the lack of appropriate models of the central nervous system (CNS) tissue. To overcome this challenge, our research group has successfully fabricated a system that supports the *in vitro* culture of CNS cells using Poly(ethylene glycol) Diacrylate (PEGDA). However, the photopolymerization mechanism of PEGDA results in the production of Reactive Oxygen Species (ROS), which are harmful to living cells. To address this limitation, we explored the use of thiol-ene ‘click chemistry’ reactions. This approach implies highly selective reagents that exclusively react with one another in a stepwise manner, yielding less ROS during the polymerization reaction and, therefore, improving the cytocompatibility of the scaffolds.

In this work, we demonstrated that the traditional thiol-ene PEG based hydrogels that use 4-armPEG Norbornene (4-armPEG-NB) terminated and Dithiothreitol (DTT) as a linear linker would not be appropriate for the scope of our research due to the toxicity of DTT. To arrive to this conclusion, we carried out a toxicity test with astrocytes and microglia, two common glial cells. At the concentrations of DTT that we would need to synthesize the hydrogel, both cells showed signs of cellular stress within the time frame we would need to fabricate the matrix.

To address this limitation, we fabricated thiol-ene PEG based hydrogels using 4-armPEG thiol (4-armPEG-SH) terminated and linear PEG-Norbornene (PEGNB) as a linker. Hydrogels at a polymer concentration of 10% w/w and varying reaction ratios of 4-armPEG-SH to PEGNB were made and characterized. The mechanical properties of the resulting hydrogels were assessed using dynamical mechanical analysis. The cumulative set of results show that the developed scaffolds are promising for the 3D culture of CNS cells and that their mechanical properties can be potentially tuned by modulating the polymer concentration as well as the 4-armPEG-SH to PEGNB ratio.

**Funding Source:** Trinity University Startup Fund
Atlanteans and Barbarians: Classical Receptions in Games

Hannah Friedrich*, Lizzie Ruetschle*, Benjamin Eldon Stevens*

Our research on classical receptions in games focuses on the ways in which games of all types transmit and transform material from the ancient Mediterranean world. Because of their ubiquity in popular culture, games form a substantial untapped knowledge base when it comes to modern understanding of Classical stories and history. The widespread influence of gaming on contemporary culture has an effect on the understanding of the Classical world for people who may have never been exposed to classical scholarship. These are understandings that Classics students will be bringing to the classroom, as well as to general pop culture as games become a more popular source of mainstream entertainment. Therefore, the impact of games on players’ understanding of Classical mythology and history carries over both into academia and into mainstream culture. Our research covers various types of games, including video and tabletop, which individually present challenges to theoretical approach. Approaches we examine include sociology, philosophy, literary studies, aesthetics, and performance studies, with a special emphasis on the experiential aspect of games. The interactive nature of games of all types sets them apart from other traditional forms of media, and therefore presents an exciting new angle for Classical reception studies. This interactivity appears in game-specific issues such as the tendency to focus on the violent aspects of games, and the conflation of all ancient history into one collective impression of antiquity. To give our audience a firsthand understanding of the multitude of theoretical approaches we have examined, as well as to emphasize the experiential aspect of the games we have studied, we invite visitors to participate in our presentation as a game.

Funding Source: Mellon Initiative
150 Years of Experiential Learning at Trinity: Context, Perspective and Implementation

Kate Nuelle (Trinity ‘21)*, Jonathan Chapman (Trinity ‘20)*, KaDarius Lee (Trinity ‘19)*, Peyton Tvrdy (Trinity ‘21)*, and Dr. Erin Hood, Dr. Lauren Turek, and Dr. Robert Scherer

In recognition of Trinity’s 150th anniversary year, our interdisciplinary team of faculty, staff, and students will create an exhibit that explores the history of experiential learning at Trinity University. The four student team members will work collaboratively to research, document, and tell the story of Trinity’s institutional commitment to experiential learning and of how the San Antonio community has participated in various incarnations of learning by doing. Using archival and ethnographic research methods, they will delve into the university archives and conduct oral history interviews with faculty, students, alumni, and community partners. Once they have completed their historical research, the students will curate the content and construct both a physical and a digital exhibit, as well as a digital database of interviews, that will first be displayed at Trinity’s Undergraduate Research and Internship Symposium. After the symposium, the exhibit will travel to various locations in San Antonio (e.g., public libraries, chambers of commerce, museums, and corporate locations) and then will return to Trinity, where we anticipate it will be housed in the renovated Chapman Center building.

The Mellon Initiative for Undergraduate Research

Funding Source: Mellon Initiative
Strengthening the Colors of PRIDE: Outreach Methods

Chiara Pride*, Chloe Sonnier*, Jared Tincher*, Ryann Williams*, Dr. Amy Stone

The Strengthening the Colors of PRIDE Project (S.C.o.P.) is funded by the Robert Wood Johnson Foundation Interdisciplinary Research Leaders program. We are in the second year of a three-year $300,000-dollar grant to study LGBTQ+ resiliency in San Antonio. In 2018, the team interviewed 82 members of the San Antonio LGBTQ+ community of a variety of ethnicities, ages, and socioeconomic positions to hear their stories and develop a measure of LGBTQ+ resilience.

We are now using this measure of resilience in a needs assessment of LGBTQ+ communities in San Antonio. Our interdisciplinary research team has developed a comprehensive survey that studies the intersections of health, adverse childhood experiences, and resilience among San Antonio’s diverse LGBTQ+ community.

Our poster presentation will focus on the process of creating, editing, and disseminating a survey for South Texas’ LGBTQ+ community. We will discuss our editing and recruitment processes including: overcoming security and screening challenges, targeting key urban and rural demographics, and building public awareness about our project. Team members worked together and independently to create problem-specific strategies. Individuals on the team advocated for security measures, one person developed a screening protocol, and we all organized to foster community engagement online and in-person. We are excited to showcase the creative methods we have used to make the Strengthening Colors of PRIDE project a success.

Funding Sources: The Robert Wood Johnson Foundation, The Mellon Initiative, and the Ronald E. McNair Postbaccalaureate Scholars Program
Optimization of a Viral Construct Enabling Neuronal Depolarization with Red Light

Jullian Valadez*, Cole Williams*, Changming Zhou*, and Dr. Gerard Beaudoin III

Optogenetics is the process by which a light-operated ion channel is expressed in neurons to enable photon-activation of action potential firing in neurons. This project identified mechanisms of innovation in the usage of optogenetics in selective activation of neural networks. Building on the work done previously with ChrimsonR, a red-shifted variant of ChannelRhodopsin identified by the Boyden lab from a novel microbe, we identified and optimized expression of the protein. Using epifluorescent and confocal microscopy, we compared GFP expression between original and optimized constructs of the plasmid by transiently transfecting the plasmid into HT22 cells, a murine neuronal cancer cell line. Optogenetic stimulation during electrophysiology confirmed expression of ChrimsonR, and evaluated the efficacy of the new plasmid. Adeno-associated virus produced with the new ChrimsonR plasmid was purified using an iodixanol density gradient centrifugation, dialysis, and anion-exchange chromatography. We are analyzing changes in mRNA expression using a quantitative polymerase chain reaction (qPCR) as the optimized expression plasmid may have increased mRNA stability and/or increased transcriptional efficiency. The purified adeno-associated virus will be surgically injected into mice to test the plasmids efficacy in vivo. Thus, we have created an optimized optogenetics vector that will enable optical control of two different inputs.
Artificial Light At Night (ALAN): An Anthropogenic Challenge for Urban Lizard Behavior and Physiology

Laura Taylor*, Tristan Tang*, Olive Pertuit, Abigail Dennis, Isabela Carson, Dr. Christopher Thawley, and Dr. Michele Johnson

Artificial light at night (ALAN) is a relatively recent phenomenon that has been shown to disrupt the behaviors and physiology of animals as diverse as humans, birds, rodents, fish, and insects. Yet, few studies have investigated the impact of ALAN on sleep itself, or on the energetic investment in reproduction. The purpose of this study is to investigate the impacts of ALAN on the nocturnal behaviors and reproductive physiology of the green anole lizard (Anolis carolinensis). The study included two groups of 24 green anoles that were captured on Trinity University’s campus and housed for the duration of the study within a controlled lab setting. One group was exposed to a normal light-dark cycle and the other was exposed to an ALAN treatment simulating the light intensity of ALAN on Trinity University’s campus. In this experiment, we examined sleep behaviors, such as sleep duration, timing, and perch position; reproductive organ development; and food consumption within the two groups. Our preliminary findings suggest that green anoles exposed to ALAN have a higher level of nocturnal activity and spend more time awake during the night than green anoles exposed to a normal light-dark cycle.

Funding Source: Murchison Fellowship
The Effects of Short Wavelength UV-B Radiation on Plant Pigmentation and Anatomy in Rural and Urban Light Environments

Andrea Nebhut*, Madison Semro*, Qifan Yin*, Dr. James Shinkle

Plants have mechanisms to sense dangerous ultraviolet radiation and regulate their responses to changes in their light environment. In particular, plants exposed to UV-B (280 to 315 nm), which includes photons of the highest energy levels found in sunlight, display unique responses such as inhibited growth and production of UV-protecting pigments. However, UV-radiation is absorbed by ozone and therefore varies with altitude and proximity to urban centers, meaning that plants grown in these microclimates may display different UV-stress characteristics. The effect of microclimate on plant responses to UV-B radiation was studied at three field sites of varying proximity to urban centers. At each field site, greenhouse-grown native Texas grasses (Bouteloua curtipendula and Chasmanthium latifolium) were placed for fourteen days under two filters, one which was UV transparent and one which blocked almost all energy at wavelengths shorter than 300 nm. The effects of high energy UV-B radiation on plant function were characterized with UV absorbance spectra taken from leaf pigment extracts, reflectance spectra obtained from whole leaves, and leaf chlorophyll and flavonoid content. Preliminary results indicate that microclimate, as well as seasonality, has a small but significant effect on UV stress responses. These results will shed light on how local air pollution affects plant growth, including the nutritional benefits and palatability of plant biomass.

Funding Source: Trinity Murchison Summer Undergraduate Research Fellowship and Texas Ecolab
Color Morph Distribution of Western Ribbon Snakes (*Thamnophis proximus*) in Texas

**Morgan Thompson**, Dr. Kira McEntire

Color is used in a variety of ways by animals, from sexual selection to crypsis and warning coloration. Color variation within a species allows for a species to adapt to the environment and can be a major driver of speciation, as is reported for the western ribbon snake (*Thamnophis proximus*). The four recognized subspecies in Texas are distinguished by their color patterns and geographic distribution: western (*T.p. proximus*), gulf coast (*T.p. orarius*), arid land (*T.p. diabolicus*) and red stripe (*T.p. rubirilineatus*). The color morphs reportedly interbreed which suggests that the subspecies are not reproductively isolated based on color. To understand which mechanisms might be driving the geographic pattern of color morphs in Texas, we first need to have a solid understanding of the current geographic distribution of each morph. Using citizen science data from iNaturalist.com and recorded field observations of the color morphs, we remapped the current range of each color morph and quantified their geographic overlap using ArcGIS software. Analyzing this geographic distribution provides a foundation to explore potential environmental factors as mechanisms driving the persistence of multiple color morphs. Furthermore the current distribution no longer matches the previous known distributions. Updated maps provide a chance to look at changes in the distribution of the color morphs both spatially and temporally.

Funding Source: Mellon Initiative, BSURF grant and the TU Biology Department
Parasitic or Transactional Juveniles? Why Social Groups Form in the Black-crested Titmouse (*Baeolophus atricristatus*)

Pippen, Charlie*, Greiner, Mikayla*, Murphy, Troy

Forming family groups is a common tactic amongst songbirds to ensure greater survivability and fitness of kin. The black-crested titmouse (*Baeolophus atricristatus*), one of many species to make use of this strategy, form peculiar groups, in which non-familial juveniles join already formed kin groups. These unrelated juveniles integrate into the groups and behave in the same way as related juveniles and share the resources and territory benefits that the group provides. Sharing resources with unrelated juveniles goes against evolutionary theory. We address the hypothesis that unrelated juveniles provide cooperative territorial defense as a transactional exchange for staying on the territory. To study the role of non-kin juveniles within family groups, multiple different groups have been observed over the course of several weeks. In order to identify specific titmice, colored bands were applied to the birds’ legs and blood was taken to genetically place them within families. Group composition, relatedness within groups, and group territories were monitored by way of tracking banded individuals —both in their groups and on their own. Once group composition is better established, we will monitor who gains access to artificial feeders using RFID technology. These results will tell us whether larger groups are more effective at dominating food resources. We expect groups with more unrelated juveniles will have better access to resources than groups with fewer non-kin members.

Funding Source: Biology Summer Undergraduate Research Fellowship, Texas Ecolab.
Fluorogenic RAFT Polymerization as a Platform for Biodetection

Madeline P. Hopps*, Christina B. Cooley

Signal amplification allows for sensitive and reliable detection of low concentrations of analyte. Polymerization amplification is a relatively new approach that takes advantage of the growth of a long polymer chain from one initiation event. The Cooley Lab is developing and evaluating a detection assay using a new signal amplification strategy that enables simple, real-time monitoring of a fluorogenic polymerization via reversible addition fragmentation chain transfer (RAFT). This method couples the polymerization initiation event to the detection of the desired analyte, making the formation of a visible, fluorescent polymer signal analyte presence. The RAFT polymerization mechanism was selected as the reactions are robust and sensitive to very low radical concentrations, can be compatible with enzymatic degassing techniques and have living character, which allows for the amount of analyte to track with the expressed fluorescence. The development and optimization of this fluorogenic RAFT polymerization for use as a detection strategy will be presented.

Funding Source: Arnold & Mabel Beckman Foundation, Welch Foundation, American Chemical Society Petroleum Research Fund.
WWII’s Forgotten Children:  
Latin Americans Interned in Texas and Exchanged with Germany

Nicole Johnson*, Teresa Van Hoy Ph.D

Most people would be shocked to hear that German Americans were interned during WWII. Even less known is that Latin Americans were arrested by American authorities, stripped of their native-born citizenship, interned in Texas, and deported to war-torn Germany. Early scholars focused on Japanese internment and the only recent scholarship on German internment has been undertaken by a journalist, Jan Jarboe Russell, and Max Friedman’s monograph, Nazis and Good Neighbors. During my year-long public history project, "Year of Remembrance," I discovered by chance that Latin American of German descent were both more persecuted than US German internees and disproportionately exchanged with the Nazis to free Americans. Drawing on oral interviews and government documents, the SURF project enables me to research German Latin American internment and exchange, and how the US and Latin America benefited from persecuting them. These research findings will be exhibited in England and Germany throughout this coming academic year.

Funding source: Summer Undergraduate Research Fellowship, St. Mary’s University Office of Student Research and Inquiry
Selfish Plants and Multispecies Communication: Ecofeminism, Critical Plant Studies, Science Fiction, and the Dark Green

Abigail Bowen*, Heather I. Sullivan

Environmental discourse tends to fall back on either nihilistic apocalyptic narratives as a result of humanity’s corrosive influence on earthly life in the Anthropocene/Capitalocene or narratives of utopian technofixes which presumably “fix” environmental disasters with human technology, all of which focus primarily on human agency. Yet, such narratives typically leave little room for the power of nonhuman, or, better, more-than-human, agents. Ecofeminist Donna Haraway crafts the theoretical framework “Staying with the Trouble” which dismisses a comic faith in technofixes and defies apocalyptic nihilism and its unproductive qualities, calling forth instead the present response-ability of living and dying on a damaged earth with our fellow living beings. As discussed by Serenella Iovino and Serpil Oppermann, material ecocriticism shares with ecofeminism an idea of “a distributive vision of agency” that can “read” agencies assuming many forms, “all of which are characterized by an important feature: they are material, and the meanings they produce influence in various ways the existence of both human and nonhuman natures.” In this paper, I will discuss the dystopian and utopian impulses in Sue Burke’s 2018 Semiosis and Joan Slonczewski’s 1986 A Door Into Ocean, which depict more-than-human material agencies and multispecies communication with a “dark green” ecofeminist perspective. I use Heather I. Sullivan’s conceptual frame the “dark green,” which draws awareness to the Anthropocene’s changes in culturally embedded human-plant relationships, emphasizing the “darkened,” or altered and polluted, aspect of the “vegetation that feeds us (and/or the animals we eat) and produces much of the oxygen we breathe.” In Semiosis, humans have moved to the planet Pax for a new beginning where plants are the dominant species and the selfish vine Stevland cultivates humans’ actions for his own benefit. Slonczewski’s novel depicts a disrupted feminist ecotopia that celebrates the nonhuman but rejects potential of stone agency. In our own present world, material agencies create possibilities for multispecies communication among plants and animals. Vegetal perceptions of light, chemical behaviors and communications, memory, touch, temperature, electricity and sound, and plants’ ability to respond to environmental cues illustrate ways in which plants adapt and communicate. Plant agency unfurls and transforms according to Johann Wolfgang Goethe (1749-1832) through “intensification,” the term he uses in his 1790 Metamorphosis of Plants, describing a process which is always in motion, malleable and conversational with surrounding environments and influences. Viewed through the dark green, plant intensification and agentic capacity, as manifested in clever selfishness for survival and reproduction, open materially-embedded chatrooms of multispecies communication between plants and anyone willing to attune their attention with more-than-human forms.

Funding Source: Mellon Initiative
Dimension Reduction Using Corr-Lasso Neural Network

Chonghao Zhang*, Shiyu Liu*, Lechuan Li*, Yu Zhang

Traditional neural network method usually reduces the dimension of high dimensionality data beforehand with correlation pre-filtering to prevent overfitting. However, such method has several disadvantages, including highly heuristic, sensitive to deviations in hyperparameters and fail to incorporate less correlated but significant features. In this paper, a novel neural network method for solving high dimensional data is proposed, called Corr-LASSO Neural Network (CLNN). By combining the features of least absolute shrinkage and selection operator (LASSO) regularization and Spearman correlation, CLNN alleviates overfitting problem by focusing on highly correlated inputs while still considering the importance of less correlated ones: it selectively applys LASSO regularization to only less correlated inputs. We show that the proposed method yields several advantages over other benchmark comparisons: it is capable of handling data with entire feature space instead of shrinking it with pre-filtering; it is more robust to deviations of correlation coefficient hyperparameter; it incorporates information of less-correlated features without arbitrarily ignores them. We test CLNN with DNA methylation data, which has a feature size of over 470 thousands, for age prediction. The result shows the improved accuracy in the test set and generalizes better in cross-validation and cross-dataset validation than pre-filtering method. To the best of our knowledge, our model yields the best age prediction accuracy using DNA methylation data compare to the existing ones. Images may be included ONLY if you or your advisor holds the copyright and if they are necessary to effectively communicate the subject of your presentation. When preparing or selecting images, note that the program will be printed in black and white. Also note that captions sometimes shift when the document is inserted into the longer program file. Please avoid captions/labels or include them as part of the image itself.

Funding Source: Mellon Initiative
Let’s Go to the Library!

Victoria Carr  Dr. Rocio Delgado

My internship was conducted at San Antonio Public Library, at Little Read Wagon (LRW) and Carver Branch Library. The internship’s initial goals were: (1) to learn more about the role of public libraries in developing childhood literacy, (2) to see how my skills are applicable in public libraries, and (3) to help LRW and Carver Branch in their offerings of linguistically diverse materials and programming. At LRW, I translated materials for the library system, and I assisted with bilingual and Spanish book research. Once a week, I helped at the summer “Play and Learn” series that take place at public parks. At Carver, I worked with the children’s librarian; this experience aided my understanding of how a branch library functions to serve the community. I shelved books, assisted patrons, and helped fulfill holds. In the children’s section, I worked in collaboration with my supervisor to make the Spanish children’s section more accessible to our Spanish speaking patrons by creating displays. I helped coordinate weekly kids’ activities which helped me to develop personal relationships with the families who utilize the library’s resources. I discovered the challenges that public librarians face when creating new programs or reexamining existing programs that aim to serve underprivileged patrons. A key piece of knowledge that I learned is that the crucial challenge for libraries, is getting people to the library. This challenge is being tackled by public librarians every day as they work to make libraries more accessible to patrons of diverse backgrounds.

Funding Source: MAS Alvarez Grant
Alvarez Internship Grant at SAReads

Camila Acosta*, Dr. Rocio Delgado

When I was applying to SAReads for my internship I applied with the intent of exploring what education looks like outside a traditional school setting. I knew that SAReads is a nonprofit that helps provide free books to teachers, and tutoring to students who are struggling in their reading. But I didn’t understand what it meant to work in the nonprofit sector. While interviewing for my internship at SAReads I was told that I would assist in the day-to-day tasks and anything else that popped up. I was hoping that I would get to interact with the teachers that came into the office and the tutoring curriculum that SAReads manages. I also wanted to interact with students, however, I knew that this would be difficult due to the fact that during the summer most students are on break.

Through my experience at SAReads I have learned a lot about how the nonprofit sector can work to support teachers in their classroom instruction and students in their learning. For example they can help provide training to teachers in order to help them improve their teaching methods, and they can help provide educational materials to students in order to help them improve their reading level. In addition to learning about how nonprofits can support teachers and students I also learned that although nonprofits provide a stimulating, interactive, and constantly evolving environment, it is not an environment I can see myself working in just yet. Currently, I am more interested in working in an educational setting that more closely resembles a classroom.

During my time at SAReads, I compiled a list of children’s book publishers throughout the United States in order to reach out to them for book donations. This list of publishers will be a much needed resource for times when the books in the SAReads book bank run low. In addition, this list will serve as a starting point for getting more bilingual books into the book bank because I marked bilingual publishers due to the fact that SAReads bilingual book section is very limited but they are interested in growing it. I also helped out at the SAReads summer camp at the Botanical Gardens, a camp in which eleven 1st and 2nd graders attended camp for free to learn about nature and animals. Furthermore, I assisted the teachers who visited the SAReads book bank, and helped them to maintain the book bank which is an important part of SAReads’ general maintenance.

Funding Source: MAS
Modeling the Effects of Hyaluronic Acid Degradation on Human Microglia Phenotype

Tyler Cagle*, Dany Munoz-Pinto Ph.D., Andrea Jimenez-Vergara Ph.D.

To study key characteristics of the onset and progression of neurodegenerative diseases or neural trauma, our research community has relied on the use of two-dimensional (2D) cell culture systems. However, 2D platforms do not provide relevant significance for cells in the central nervous system (CNS) since these cells experience three-dimensional (3D) environments. To address this challenge, our study was aimed at fabricating and characterizing multi-interpenetrating networks (mIPNs) of varying chemical composition to resemble the viscoelastic properties seen in native CNS tissue. In addition, it was crucial that the constructed mIPNs could provide a microenvironment that both withstood and facilitated cell spreading and appropriate phenotype expression. In creating these mIPNs, we aim to procure a 3D model of neural tissue that could be utilized to better investigate the mechanistic underpinnings of neural trauma and neurodegenerative diseases. Toward this end, we fabricated and characterized a family of mIPNs comprised of poly(ethylene glycol) diacrylate (PEGDA), Collagen I (Col I) and hyaluronic acid (HA).

To evaluate whether the mIPN platform could regulate cell behavior, we used microglia as cell models. Microglia are one of the most prominent cell types in the CNS and are key regulatory cells that are involved in the onset and progression of neurological diseases and neural trauma. The microglia were encapsulated in the mIPNs with similar chemical properties but differing HA molecular weights (high: 1.5 MDa; low: 40 kDa). The formulations for the mIPN were selected based on previous research by our lab. Microglia cultured in the mIPNs exhibited high cell viability while promoting branched out morphologies. Once the mIPNs were constructed, the effect of HA molecular weight on microglial phenotype expression was evaluated. Microglia were then stained for the pro-inflammatory (M1) markers TNFα, IL-1β, iNOS, and CD86, and for the alternative activated (M2) marker CD206. These markers were used to evaluate which formulation could induce an inflammatory response. The protein expression was evaluated at 3 and 7 days. Phenotypic expression was quantified using confocal microscopy imaging along with the ImageJ 2 (FIJI) program.

Funding Source: The Alzheimer’s Association and Alzheimer’s Texas (AARGD-17-531470)
Evaluation of the Effects of Lipopolysaccharides (LPS) on Human Astrocyte Phenotype and Metabolism

Abigail Jones*, Andrea C. Jimenez-Vergara, Ph.D., Kara Poole, Dany J. Munoz-Pinto, Ph.D.

Astrocytes are glial cells found in the brain and spinal cord. They display a large spectrum of functions at the cellular level, including maintenance, support and repair of nervous tissue. Astrocytes also play a role in higher integrated brain functions such as information processing and memory formation. Thus, the abnormal function of astrocytes can lead to major alterations in neuronal functions which contribute to the pathogenesis of several neurological diseases, including Alzheimer’s disease (AD). Dysfunctional astrocytes have been linked to the development of inflammation in the central nervous system (CNS) tissue which is a contributing factor to the onset of AD.

In this work, we explored the effects of LPS and various concentrations of Antioxidants (A1 and A2) on the metabolic activity and the modulation of the reactive phenotype of human astrocytes. Toward this end, astrocytes were cultured for 3 days using growth media with LPS to determine the timepoint where an early inflammatory response was exhibited by the cells. Samples were collected at 0 h, 6 h, 24 h and 72 h. Quantitative real-time polymerase chain reaction (qRT-PCR) was used to assess the expression of Glial fibrillary acidic protein (GFAP) and S100 calcium-binding protein β (S100β) at the gene expression level. We also cultured astrocytes in growth media supplemented with LPS and 0, 25 or 50 µM A1 or A2. Protein, DNA, and mRNA samples were collected for analysis. qRT-PCR was used to evaluate the effects of A1 and A2 on cell behavior in response to the reactive phenotype induced by LPS. In addition, astrocytes were stained with JC-1 to evaluate mitochondrial activity. Changes in metabolism were also evaluated using the Vybrant Metabolic Assay and Adenosine triphosphate (ATP) production was quantified through a luminescence assay. This work could be used as an approach to contribute to the understanding of inflammation in astrocytes and their relation to neurological diseases. Specifically, results from this research could lead to the development of novel therapies for the treatment and progression of AD through providing insight to the connection between inflammation and phenotype and metabolic activity in astrocytes.

Funding Source: Murchison Summer Undergraduate Research Fellowship
Analysis of Dashcam Video for Determination of Vehicle Speed

Alvaro Márquez*, Jack Leifer, PhD

Videogrammetry is a well-known approach for using streams of images to accurately measure motion. With the increasing use of video for surveillance of all kinds, multiple efforts have been underway to extract quantitative measurements for a variety of purposes. This is often difficult, especially when the available video comes from cameras whose optical parameters are not known. One means of overcoming such difficulties lies in the use of visible landmarks within a video frame whose three-dimensional locations and geometry are available. For certain dashcam videos, such information can be extracted from Google Earth, and used for image calibration. Previously, we hand-calibrated streams of images from dashcam video using an online pixel ruler and determined vehicle speed based on sequences of painted lines on local San Antonio roadways and parking lots, taken with a dashcam operating at a known frame rate. In efforts to refine this approach developed last summer, we used a commercial videogrammetry software tool (Photomodeler) with Google Earth. Photomodeler was developed in conjunction with NASA personnel almost two decades ago and has been verified capable of producing 3D models and extracting quantitative measurements from photographs. Here, we use video from just one camera to determine vehicle speed. Once the global origin has been selected (the initial 3D camera position where video stream begins), the three-dimensional positions of identifiable features are located in the first image relative to that global origin. While the absolute position of the camera changes with each successive image of the video stream, its location relative to the image frame remains the same. Conversely, the position of each identified feature (relative to the global origin) remains stationary in the environment, even though its position relative to the moving camera (as well as its position within the video frame) changes in each successive image. Therefore, the known absolute coordinates of each identified feature can be used to identify how the position of the camera changes in each successive image. The camera’s absolute location (which is affixed to the vehicle’s dashboard or window) is determined through successive frames by using verified 3D measurements (x, y, z positions) produced by Google Earth – along with latitude/longitude coordinates. We applied our approach using dashcam footage recording at 30 frames per second on US-HWY 90 towards San Antonio, TX, and inputted our data into the average speed equation \( v = \Delta x / \Delta t \) (distance travelled divided by time interval). Our results were compared with the speed provided by the satellite-based speedometer display in the GARMIN dashcam footage to evaluate the effectiveness of this approach.

Funding Source: McNair Scholars Program
Modeling Biofilm Growth In Pipe Flow

Abraham Ybarra* (Math, Trinity University), Hoa Nguyen (Math, Trinity University), Hakan Başağaoğlu (Edwards Aquifer Authority), Orrin Shindell (Physics, Trinity University), Frank Healy (Biology, Trinity University)

We present a new numerical model, based on the immersed boundary method, to simulate the formation and growth of biofilm in shear flow in a pipe. Biofilm is a clustering of microorganisms that are embedded in slimy extracellular polymeric substances and can adhere to each other or onto a solid surface. The biofilm is modeled as a dynamically-evolving viscoelastic, porous structure, composed of Lagrangian nodes connected by elastic springs with tunable stiffness, in Poiseuille flow. The model accommodates advective-diffusive transport of a substrate as well as consumption of the substrate by the biofilm, resulting in biofilm growth according to Monod kinetics. Numerical simulations not only successfully reproduced benchmark biofilm structures, including finger-like or mushroom-shaped structures, but also revealed unprecedented biofilm structures in different environmental conditions.

Funding Source: National Science Foundation grant DMS-1720323 and Mach Fellowship (Trinity University)
Modeling *E. coli* Chemotaxis in viscous Fluid Near a Surface

Savannah Hardzog*, Dr. Hoa Nguyen, Dr. Orrin Shindell, and Dr. Frank Healy

Chemotaxis is the movement of motile cells towards or away from a chemical substance in the environment. We simulate chemotactic motion of the bacterium *Escherichia coli* (*E. coli*) through a chemical gradient in a viscous fluid near a surface. We combine the software package, Signaling Pathway-Based *E. coli* Chemotaxis Simulator (SPECS), with a fluid dynamics computational method, Method of Images for Regularized Stokeslets (MIRS), to simulate bacteria-fluid-surface interactions as the cells perform a biased random walk up the chemical concentration gradient. SPECS is a spatially two-dimensional model that uses *E. coli*’s internal signaling pathway dynamics to predict the chemotactic movements of many individual cells in a vacuum environment. To make a more realistic simulation, we extend SPECS to three dimensions and incorporate MIRS to account for the viscous medium and the bacteria’s proximity to a surface. In our simulations, we find that the no-slip boundary condition enforced in MIRS causes the cells to be stuck to the surface. Going forward, we plan to incorporate additional force interactions between the bacteria and the wall to better match our simulation results with experimental data.

Funding Source: National Science Foundation grant DMS-17020323 and Trinity University
Bacterial Motility Near a Surface

Nicholas Coltharp*, Mica Jarocki, David Clark, Orrin Shindell, Hoa Nguyen, Frank Healy

Bacteria spend much of their time in complex environments: colonies of bacteria form biofilms on surfaces, and even free-swimming bacteria may find their range of motion limited by their environment. To understand how they navigate through such environments, our first step is to construct a physically-realistic computer model of an E. coli bacterium and then use the method of regularized Stokeslets and the method of images to compute its swimming speed, body rotation rate, and flagellar torque in a homogeneous viscous fluid. As we vary the distance of the model bacterium from a surface, our results agree well with those of other techniques, and with known experimental values. Our next step is to explore how the swimming speed, rotation rate, and flagellar torque vary when multiple bacteria closely interact. Then we can simulate the bacterial model in heterogeneous fluids with suspended microstructures such as elastic polymers and filamentous networks, similar to what real bacteria experience.

Funding Source: National Science Foundation grant DMS-1720323 and Trinity University.
Bacterial Motility Near a Smooth Surface: Experiments and Analysis

Quan Hoang* (Math, Vietnam National University in Hanoi), Keaton Holt* (Physics, Trinity University), Benjamin Pfeiffer (Physics, Trinity University)
Dr. Orrin Shindell (Physics, TU), Dr. Frank Healy (Biology, TU), Dr. Nam-Dung Hoang (Math, VNU), and Dr. Hoa Nguyen (Math, TU)

Motile bacteria play a pivotal role among forms of life on Earth and studying them has many real world applications. In particular, studying how motile bacteria interact with a smooth surface provides understanding about their transition from living as free-swimmers in the fluid to being a part of a surface aggregated community. Such knowledge can be useful in the resolution of medical problems like infections in the lungs of cystic fibrosis patients.

In this work, we report the reconstructed motion of the motile bacterium Escherichia coli (E. coli) from 2D images generated by Total Internal Reflection Fluorescence (TIRF) microscopy. The Trackpy package for Python allows us to follow a bacterium along its trajectory while acquiring an initial estimate of its position in 2D space at each step. Then, from the collection of brightly lit pixels that make up an instance of a bacterium, we use our in-house Ellipsoid Fitting Algorithm to determine its 3D position and orientation relative to the surface. From these parameters, we further extract the velocity, the localized radii of curvature of the trajectory, and the orientation relative to the local axes defined by the trajectory.

Funding Source: National Science Foundation grant DMS-1720323 and Trinity University
Returning to Normalcy: The Perils of Restoration Politics

Sara Heridia*, Dr. David A. Crockett

“Political time” is a partisan regime model of American politics which argues that presidents face different leadership opportunities and constraints depending on when in a political era they take power. In Stephen Skowronek’s political time paradigm, “regime builders” (Lincoln, FDR, Reagan) repudiate the established order and institute a new political era, setting the terms of debate for that time. After a regime has been founded, different types of regime affiliates (Grant, Carter, H.W. Bush) can take different political strategies, depending on the political-institutional order set by the regime builder. Opposing the established order are the “opposition presidents” (Johnson, Eisenhower, Clinton), who come to power opposed to the dominant party, but are forced to play by its rules.

Within this schema, we are observing a newly identified regime affiliate: the “restoration president.” Restoration presidents come into power after an opposition president interlude and are tasked with re-articulating the political agenda of the regime builder and correcting an opposition president’s politics. Such “restoration presidents” have occurred many times in the past. Their ranks include Polk (after Tyler), McKinley (after Cleveland), Harding (after Wilson), and Kennedy (after Eisenhower), among others. In our own era, most scholars acknowledge that we are still in the Reagan regime, with George W. Bush seen as a regime manager trying to advance the political project established by Reagan. However, unlike his father, since he came to power after an opposition party interlude (Clinton), George W. Bush was given the task of restoring Reagan’s agenda. We focused on the Reagan-era restoration presidency of George W. Bush, seeking to understand how he fits into this restorative pattern. Understanding the Bush presidency ultimately lends tremendous importance for the understanding of our own era, including the restoration presidency of Donald Trump.

Funding Source: Mellon Initiative, McNair Scholars Program
Suing the U.S. Government: A Summer at RAICES

Monica G. Baez, Dr. Katsuo Nishikawa Chavez

RAICES is a non profit organization that provides low-cost legal and social services to immigrants and refugees, while also advocating for their rights. This summer I had the pleasure of working with the Litigation Program, which protects the constitutional and human rights of RAICES clients by taking cases to federal, appellate, and international courts. As an intern, I conducted research for the U.S. government’s standards and budget for detention centers. This research will serve as the foundation for efforts to prove that the government’s failure to meet adequate standards of family and child detention, with the ultimate goal of shutting down privately-owned detention centers. I also worked with clients and the rest of the litigation team in drafting and submitting case documents. I learned that I want to continue serving the immigrant community in a nonprofit organization such as RAICES. I am extremely thankful to Dr. Doebbler and the rest of the Litigation Team for making me a part of their family and allowing me to work on such important cases.

Funding Source: Alvarez Internship Grant
Connections IFS Internship

Gemma Smith*, Tayler Weathers*, Jane Childers.

We spent our summer at Connections Individual and Family Services (CIFS) in New Braunfels, a non-profit that serves at-risk and underprivileged youth in an 11 county area. We had the opportunity to spend time in all three of CIFS’ main areas: the shelter for runaway and homeless youth, family and individual counseling, and an early intervention substance abuse prevention program in elementary schools. At the shelter, we engaged in a discussion on wellness and self care with the youth, and shadowed counseling sessions with an LPC. In the counseling program, we helped counselors gather and audit their files, and sat in on sessions and supervisions. With the Substance Abuse Prevention team, we went out to five area elementary schools to teach children the “Positive Action” curriculum using games and other activities. As future counselors, this experience was invaluable to understanding our options, our careers, and the life of a non-profit counselor. Overall, we discovered that the non-profit sector of the mental health profession is an ambitious field that meets a unique need and is accompanied by a myriad of challenges as counselors attempt to balance the requirements of their funding sources with their delivery of evidence-based practices.
Can Children Compare Events Over a Delay to Learn Verbs?

Bibiana Cutilletta*, Katherine Capps*, Chris Lewis*, Jane B. Childers

To learn a new verb, children may compare events in order to understand the meaning of the verb (e.g. Childers, 2011; Scott & Fisher, 2012). By comparing events, children should be able to discern the important parts of the verb’s meaning and extend that verb to new objects. It is unclear whether children benefit from comparing similar or varied events. Similar events are easier to compare to each other, but varied events lead to greater generalizability. In real life, children hear verbs that are separated in time, but no study has asked how a delay between comparisons can affect the child’s ability to compare.

In this study, 3-year olds (n=31) and 4 year olds (n-36) saw three similar novel events, 3 varied novel events, or a single novel event while hearing a new verb. Events were shown live and were accompanied by a familiar action (distractor). The learning phase consisted of three familiar actions (e.g. a dog being pulled in a wagon) then a novel action (e.g. a sundae being flipped with a spatula) followed by a one-minute reading delay. Children were then asked to extend the verb with new objects in two test trials. The process was repeated with a second verb.

A univariate ANOVA with Age (2:3s,4s) and Condition (3: similar,varied,control) shows a main effect of condition, $F(2,66)= 3.79, p<.03$. Children were able to extend the verb when seeing either similar or varied events but only those seeing highly similar events varied from the control condition (who performed at chance). Children did benefit from comparisons, even when they were separated by time and the results favored the more similar comparisons over the more varied ones. These results are discussed further in reference to current theories including Structural Alignment (e.g. Gentner, 1989).


Psychology Department
Murchison Fellowship

Funding Source: Mellon Initiative
Examining Links Between Actions and Verbs in Cross-Cultural Settings

Aria Gastón-Panthaki*, Sophia Elsadig*, Claire Stafford*, Dr. Jane Childers

To fully understand children's language acquisition, simply studying one language and culture is not enough. This study examines children and their mothers at play in varied contexts to discover how often children see associated actions when hearing new verbs, and discern differences between Spanish and English speakers. Past studies suggest verb acquisition is more difficult than noun acquisition. Nouns often refer to static objects that one can point at, while verbs often refer to dynamic actions within an ongoing stream of activity and actions to which a verb refers can have many variations. A key question is how children link verbs to specific actions. Just as in any part of a language, parents have an impact on children’s verb acquisition. This study compares Spanish and English children ranging from 19-36 months as they play with their mothers. Children were filmed in naturalistic, familiar settings. Typically, in verb acquisition studies in the lab, children are shown actions while hearing their associated verbs, but we suspect that this does not consistently happen in the real world. Our study will be the first to document how often verbs occur with specific actions in everyday life. To code the data, twenty videos were digitized and each verb said was recorded. Coders then watched the videos second-by-second, noting the exact time a verb is said (by the child or parent) and whether an associated action was in view. To date, preliminary results with only English-speaking children show that 8% of the time these children were seeing actions associated with the verbs that were said. This summer, we were able to code all of the Spanish-speaking dyads and will report on the number of times verbs were said and related actions were seen, and the time delays between words and actions, in this Spanish sample. We can then compare data from these two language groups and cultures to better understand variation in language learning across environments.

Funding Source: MAS
Hair Cortisol Concentration in Chimpanzees (Pan troglodytes) and its Correlates

Ari Bearman*, Kit Jaspe, Kathleen M. Brasky, Mel de la Garza, Kimberley A. Phillips

Activity of the hypothalamic-pituitary-adrenal (HPA) axis can be measured by quantifying the blood plasma concentration of glucocorticoids, the most significant of which in primates is cortisol. There are numerous other ways to detect circulating cortisol, such as saliva or urine, but the incorporation of circulating steroids into growing hair permits the best metric for determining a retrospective long-term average of HPA axis activity. The quantification of hair cortisol concentration is a valuable research tool, because cortisol has been associated with a broad array of functions, including the inhibition of inflammation and promoting the conversion of adipose tissue and amino acids into glucose. Previous research with non-human primates has shown a multitude of social factors that correlate with hair cortisol concentration, including rate of receiving aggression, rank in a social hierarchy, and recent changes in housing situation. Such results, considered together, suggest hair cortisol concentration may be a metric of chronic social stress.

The present study seeks to broaden our understanding of the social phenomena which may account for some of the variability in hair cortisol concentration between chimpanzees. Hair samples from chimpanzees (N = 86; male = 40, female = 46) from a variety of social group formations (opposite-sex pair, same-sex pair, multiple males, multiple females, single-male-multiple-females, and multiple-males-multiple females) were collected opportunistically at regular health check-ups. The hair samples were washed in isopropanol to remove sebum and other contaminants, which have been shown to also contain traces of cortisol. Samples were ground in a ball mill before methanol extraction. Enzyme immunoassays will be performed to determine hair cortisol concentrations. Other data on each chimpanzee was also collected, including age, sex, and group stability. Once immunoassays are conducted, we will present and discuss results.

Funding Source: Trinity University Neuroscience Program
ALE Summer Internship:

San Antonio’s Nonprofit Sector: The World of Fast-Paced Consulting

Arianna Siddiqui*, Ruben Dupertuis

This summer I had the privilege of interning with Burnam | Gray, working directly under its co-principal and founder John Burnam. Due to the nature of consulting, I had the opportunity to work with three different clients on three main projects; Girls On The Run, Silver Black Gives Back, and the Texas Bar Association. This poster will examine the skills I have gained through this internship.

One of these skills was communication. This summer I completed a comprehensive social media audit and analysis for the nonprofit Girls On the Run (GOTR). Then, I was able to present my findings and recommendations to GOTR’s marketing team. In preparing for the presentation and during the presentation itself, I learned how to best present information both orally and visually to create the maximum impact with our client. Furthermore, I was also tasked with researching complex legal issues regarding nonprofit compliance law for the Texas Bar Association. In doing so, I discovered how to translate my academic research skills into a work-based environment, as well as being able to condense intricate legal texts into understandable key points. Finally, my work with Silver Black Give Back (SBGB) gave me the opportunity to analyze survey responses from over one hundred people and explorable patterns and trends.

Funding Source: Arts, Letters, and Enterprise Minor
LuxTurn Technologies LLC

Robert Magee*, Chris Stewart, Dr. Luis Martinez

LuxTurn Technologies has developed an aftermarket turn signal and brake light for motorcycles. It is a turn signal that will project a five foot by five foot, equilateral, flashing triangle onto the road along the sides of the bike. The brake light projects a rectangle on the road behind the bike. As a company we understand that in 2017 over 5,100 motorcyclists died on the road from accidents involving a car. Our mission is to improve the safety of these motorcycle riders. During illit rides, our turn signal will improve the visibility of motorcyclists, ultimately saving lives.

Funding Source: Trinity Entrepreneurship
Spreading Stories with Comics and Kids

Chikanma Ibeh*, Wren Ramos*, Dr. Luis Martinez

Storyspread is dedicated to inspiring children to grow their creativity by giving them the space and support to create. Our mission is to give kids an accessible avenue for storytelling and creativity through comic book creation. Using our digital comic book creator, kids are able to create their comics without any pre-existing skills. We then hold workshops with the kids to help them make their own comic and teach them about storytelling, developing their writing and reading skills in the process. We strive to nurture children's inherit creativity by giving them a space to create and taking away the boundary of skill to make their own comic books.

Funding Source: Trinity Entrepreneurship
SUPPORTING SAN ANTONIO’S FORGOTTEN COMMUNITY WITH CATHOLIC CHARITIES

Maureen Gallington*, Erin Hood

This summer, I was honored with an internship with Catholic Charities at their Guadalupe Community Center location. Catholic Charities is a nationwide nonprofit that serves those who have been left out, specifically homeless and low-income individuals and families. At the Guadalupe Community Center, they do this by providing food, clothing, and financial assistance to the low-income as well as sack lunches to the homeless. My responsibilities this summer included answering calls, directing clients, meeting with clients about their applications, case managing, data entry, and receiving donations. As a personal project, I have also been working on updating the center’s resource list. This entails researching into our current resources, updating them if needed, as well as adding resources that I have found and felt were important to add.

Hectic as it was, I absolutely loved and enjoyed the entirety of it. Because of the nature of my internship, I was really able to see the intricacies and inner working of a nonprofit such as Catholic Charities. This has given me insight into the nonprofit world, a world that I am heavily considering as my future career. I have learned that nonprofits can be very fast pace. They can also be very difficult because assistance is limited, and help cannot be given out to everyone. More importantly, however, this internship has allowed me to witness first-hand how difficult struggles can be for homeless and low-income individuals and families. It has motivated me to continue to try to better this city and this world, if not through my future job and career, then through volunteer work and giving back to organizations like Catholic Charities.

Funding Source: Arts, Letters, and Enterprises
Working with Immigrants: A Summer Internship at RAICES

Jaelyn Jernt*, Dr. Jacob K. Tingle

This summer, I interned through Trinity University’s Arts, Letters, and Enterprise program at an organization called RAICES: Refugee and Immigrant Center for Education and Legal Services. I worked primarily with the Post-Release Bus Station program at the San Antonio location. Through my internship I gained experience to supplement my Spanish and International Studies majors as well as unique knowledge from hands-on interactions with an organization in my career field of interest.

The internship gave me the unique opportunity to provide post-release documentation orientations to immigrants after they were released from detention. I was also tasked with writing a comprehensive report for the one-year anniversary of the San Antonio Bus Station Program. Through both halves of those experiences at RAICES I learned of all aspects of the immigrant journey and experienced, at the grass-root level, how immigrant families are affected by United States Department of Homeland Security (DHS) policies. I was exposed to both the political and social sides of the refugee experience. Specifically, I now have a deeper awareness of the government’s role through Customs and Border Patrol (CBP) and Immigration and Customs Enforcement (ICE), and immigrant stories as they fled troubled home countries and sought asylum in the United States. I have gained invaluable knowledge and enriched my passions on this issue which aligns so closely with my classroom education. My experience this summer has expanded upon my education and has afforded me professional experience in the immigration and social work sector, and will serve as a foundation for my future as I apply what I have learned in my own work.

Funding Source: Arts, Letters, and Enterprise minor
Marketing Nonprofit News

Kara Killinger, Dr. Erin Hood

The Rivard Report is a nonprofit newsroom that provides the city of San Antonio with free online coverage. Founded in 2012, the Rivard Report is devoted to publishing credible information without obligation to outside owners or interests. The Rivard’s mission is to become San Antonio’s most trusted and lively source of news and commentary.

As a Marketing and Audience Engagement Intern, I was responsible for various upkeep tasks within the business office. My daily tasks included creating lists of prospective members, writing thank you letters to acknowledge gifts, updating the online membership page, and filling in advertising analytics reports. I also assisted in creating and mailing over 700 appeal letters to prospective members over the course of the 10-week internship.

In addition to gaining exposure to the marketing and business practices of a nonprofit newsroom, I was able to obtain some editorial experience while working for the Rivard Report. Consulting with professional editors and reporters, I wrote multiple articles which were then published on the Rivard Report’s website. Topics I covered included immigration and local art.

Over the course of my internship, I gained proficiency with business tools including Salesforce, Microsoft Excel, and Google Ad Manager. In addition to gaining hard skills, I refined my communication abilities: By reaching out to individual prospective members, I honed my skills in persuasive formal writing, and while reporting, I worked on both interviewing skills and ability to cull the most relevant details from a large body of information. Members of the Rivard Report’s team also served as exemplary models of both strategic planning and kindness; observing the organization’s positive office culture taught me what professionalism should look like.
Building Bridges with the San Antonio Community: My Time Interning with RAICES

Javier De Luna*, Dr. Jacob Tingle

This summer, I had the honor of undertaking an internship at RAICES (Refugee and Immigrant Center for Education and Legal Services). This internship was coordinated through Trinity’s Arts, Letters and Enterprises program. Being true with its mission, this internship enabled me to understand and learn about the non-profit world and complex topics associated with and surrounding immigration. This opportunity also provided first-hand experience with immigration law and this aided my career exploration by giving me a better understanding of immigration law. My position at RAICES was a Volunteer Operations Intern and my primary role was to help the volunteer operation team coordinate enriching volunteer activities, be present at community events to promote awareness and manage the large number of volunteers on a daily basis. This poster will examine the skills I have gained and the lessons I have learned during this experience.

One of the important skills I learned is interpersonal communication. Among other ways I interacted with volunteers on a daily basis and gave various orientation presentations to large groups. I was also tasked with answering the RAICES hotline and provide assistance on locating a missing family member or give accurate information about the legal services we provided. Finally, RAICES provided me various opportunities to understand what being an immigration lawyer is and how to interact in a court setting. This gave me an invaluable insight which will be useful in determining my future career path.

Funding Source: Arts, Letters, and Enterprise minor
A Summer in the Office of State Representative Diego Bernal

Emily Bourgeois*, Eduardo Balreira

I will give an overview of my internship experience with the office of State Representative Diego Bernal. My daily responsibilities fell into two categories: constituent services and legislative research. During my role in constituent services, I learned more about the issues facing the communities that we represent by attending neighborhood association meetings and assisting with constituent casework. I utilized the Constituent Management Software to connect people with the best government agency to address their needs. For responsibilities on the legislative end, I was given the opportunity to complete three memos on a wide range of policy areas; including Medicaid, insurance, and climate change. Overall, my internship helped me gain a better understanding of what a future career in public policy might look like. I attended a variety of summits and city meetings as a representative of the office, which allowed me to refine my networking skills and get a surface-level understanding of issues. This opportunity opened my eyes to the possibilities available to me if I choose to further my education in social policy.

Funding Source: Arts, Letters and Enterprises Program
Music has been an important element in Trinity’s educational mission from the founding of the school in 1869. Over time, as the university moved campus locations, the scope of musical activity on campus naturally evolved to reflect changing priorities of the faculty and students. As part of my Arts, Letters, and Enterprise internship at the Trinity University Music Department, I spent this summer researching the history of the department, focusing on influential faculty members and student involvement in music at the Tehuacana, Waxahachie, and Woodlawn campuses. I also did research into the portrait of Elizabeth Coates Maddux currently on display in the Special Collections room in the library, curated a historical exhibit in the music lounge of the Dicke-Smith Building, and helped to complete organizational tasks for the department. Building on the work of previous interns, I drafted the first complete listing of faculty up to the end of the 20th century. At the recommendation of my supervisor I drafted a 40-page historical overview of music at Trinity — the first-ever written history of the Music Department from 1869 to 1952.

The structure of my internship allowed me a fair amount of freedom to follow personal curiosity, requiring me to improve upon my work ethic and time management skills to accomplish the goals my supervisor and I set for the summer. I also had several opportunities to strengthen both my written and verbal communication skills as I collaborated with Trinity faculty and staff. My primary goal for this internship was to hone my ability to organize my time, resources, and energy towards a long-term project. I sought to satisfy my curiosity about the history of the music department and create an end product that would help inform others about that history. To that end, this poster will display some of the information I’ve compiled this summer and give a small sense of the beginnings of the 150-year history of music at Trinity.

Funding Source: Arts, Letters, and Enterprise program
The Song that Data Sings: My Summer Internship at the Children’s Chorus of San Antonio

Amanda Chin*, Carl Leafstedt

The Children’s Chorus of San Antonio is a non-profit organization that runs choral ensembles and music programs for children eighteen months through eighteen years old. In these ensembles and programs, kids get the opportunity to grow and develop their personal and musical skills. This organization was an excellent place to learn more about many different areas in the non-profit business world. This internship provided me with experience in Marketing, Accounting, Finance, Human Relations, Management, and Data Analytics all in ten weeks.

Throughout the summer I’ve learned how to manage myself, my time, and my skills in the workplace. During this internship, my personal goals were to improve my interpersonal communication skills and improve my work ethic. My professional goals were to learn more about the programs and tools most relevant to my field of study. My supervisor Anne Schelleng, Executive Director, helped me reach these goals by teaching me her way and allowing me to learn my way.

Some of my tasks were very structured, doing extensive data entry and sorting through Salesforce, a powerful online tool in cloud resource management (CRM). Others were left to my interpretation. My biggest autonomous project during the summer was to clean and analyze Developmental Asset Profile (DAP) survey data. This survey evaluates the social and personal growth of kids in the Children’s Chorus. Using Tableau, a leading data analytics program, I tracked their growth over time and wrote a report on how well the Children’s Chorus is helping them in that growth.

The experience I had this summer was invaluable and very well rounded. I was able to learn better communication skills, how to utilize my time in the face of having no assignments, and gain experience with tools that will give me a one-up in my future career.

Funding Source: Arts, Letters, and Enterprise program
Finding the Beat: Learning What Makes a Nonprofit Run

Savannah Hooper*, Carl Leafstedt

This summer, I had the privilege of interning with the Youth Orchestras of San Antonio (YOSA). YOSA is a nonprofit that makes excellent music education accessible to kids across San Antonio, regardless of socio-economic background. I applied to this internship through the Arts, Letters, and Enterprise program at Trinity University. This program provides a unique opportunity for students in the social sciences and humanities to explore the nonprofit business sector and develop valuable skills for a successful career. As an intern on the YOSA development team, I helped write a grant, pulled statistics and student demographics from the 2018/19 YOSA season, compiled multiple mailing lists for potential donors, and helped build and redesign the new YOSA website.

Working on these projects taught me to be creative in how I approach projects with broad guidelines; I developed proficiency in Excel and Squarespace, and improved my technical writing. This internship showed me what the development side of the nonprofit sector entails and taught me how development is what makes a nonprofit run behind the scenes. This poster will explore the diverse assignments I received that taught me not only practical skills, but also how much focused time it takes to reach donors and how important it is for a nonprofit to know and tell their story effectively.

Funding Source: Arts, Letters, and Enterprise program
La Escuela De Estella

Estella Marie N. Frausto*, Luis Martinez

During the Summer Accelerator I have been working on forming my business, La Escuela De Estella. La Escuela De Estella, is a Texas Limited Liability Company, LLC, which will concentrate on encouraging more students to take and stick with a path in music, specifically mariachi music. We focus on helping students develop their professional and academic skills by offering courses not taught in a regular school music program and giving the students opportunities to experience the musical job market first-hand. Throughout the summer we have been working on customer outreach, discovery, and so on. It has been really helpful to reach out to other music programs, not all of them were for mariachi, to see how they run their operations. We hope to create a similar infrastructure that will be flexible to our students, but offer teachings focused on traditional mariachi music.

The Summer Accelerator is an opportunity for each of the five Stumberg finalists to work on their business and have support and build connections with Trinity alumni and the San Antonio entrepreneurship community. It was also a course to prepare us for the final Stumberg round in the fall.
heARTful

Chryslyn Perkins*, Bradley Sykes*, Dr. Luis Martinez

heARTful is a nonprofit organization that aims to provide all people the opportunity to engage with art. heARTful transforms the typical visual engagement of a piece of art into a tangible, interactive experience. Throughout the summer accelerator program, heARTful has worked to create a blueprint for what an interactive art piece should look like to ensure that each piece encourages individuals to express their thoughts and feelings, promotes self esteem, builds communication skills, and serves as a medium for art education. Originally, heARTful’s plan was to file as a 501(c)(3) nonprofit organization and to work directly with local organizations that provide resources for individuals with special needs. However, heARTful has pivoted and will now be filing as a nonprofit organization under the fiscal sponsorship of another fine art organization. Through this partnership, heARTful will only create interactive art pieces for this organization, who will then implement the pieces into their arts programming at various special needs organizations throughout San Antonio.

Funding Source: Trinity Entrepreneurship
Live Monitoring Keg Contents

Brian Guerrero*, Dr. Luis Martinez

Live monitoring the liquid contents of a keg is rare among existing breweries and taprooms. Consequently, large companies lose massive amounts of profit annually via remnants of coffee/beer left in kegs, and smaller companies or start-ups like Quick Sip suffer from business inefficiency. This system seeks to eliminate these problems by reducing loss for larger companies, and increasing business efficiency for small scale companies like Quick Sip Coffee. Specifically for Quick Sip, clients who purchase kegs to be placed in kegerators, reach out when they are out of coffee and need more. This then causes Quick Sip to be able to brew 30 plus gallons of coffee, bottle/keg it, and then transport it as fast as possible, or by a certain deadline. Instead, with this system implemented, Quick Sip would already know when the kegs were getting low, and plan accordingly.

Quick Sip plans to utilize this system to boost business efficiency with the intentions of scaling up. In doing so, this system will be monetized and then pitched to investors. That way, this system can be the foundation of a separate business that charges companies in return for the installation of the system. That way any company, large or small, can have the ability to live monitor the contents of their kegs.

Funding Source: Students + Startups
The Application of Fengshui to Ecological Urbanization

Julia Plante*, Stephen Field

This presentation provides insight into how an ancient East Asian belief system can integrate with modern efforts to urbanize in an ecologically-friendly manner. As developing countries progress toward the status of developed nations, many raise the question as to how society can advance in a manner that does not threaten the sustainability of the environment. Fengshui emerged in China millennia ago as agricultural communities spread across the Central Plain, and the people began to ponder how to preserve the environmental energies that sustained them.

Considering the present-day impact of advancing human civilization, some have inquired if older beliefs regarding coexistence with the environment can assist in curbing the human society’s detrimental effect on nature. In exploring this idea, this presentation examines China’s eco-city initiative and environmentally-friendly policies as well as the ways in which Fengshui encourages a harmonious existence between humanity and the natural environment.

Funding Source: Sharon L. and Donald E. Kurtti Fellowship for Summer Research in China
Undergraduate Research in the Arts and Humanities: Student Perceptions of the Self, their Research, and the Mellon Initiative

Simone Washington*, Dr. Lisa Jasinski

Given the dearth of information regarding undergraduate research experience in the arts and humanities and Trinity’s status as a small, liberal arts Predominantly White University, researchers crafted an investigative study unique to the Institution. In it, we explored how undergraduate researchers within the Mellon Initiative describe their experiences in the program, as well as, how faculty mentors and program administrators attempt to shape these experiences. This exploratory single-site case study examines Trinity’s Mellon Initiative in which research is conducted by students and corresponding faculty mentors during a ten-week structured program.

Analyzing written and photographic data that researches collected through interviews, surveys, focus groups, and photovoice (Latz, 2017), we stand to understand student experiences within the Mellon Initiative. To analyze the data, we used sensemaking as our theoretical framework (Weick, 1995) to understand how Mellon students assign meaning to their collective experience.

In the poster, we will present key themes that arose from the myriad of experiences that participants shared with us. For example, time constraints and mentor/mentee relationships were both factors that substantially impacted students’ experiences in the program. In addition, respondents created pictographic representations of their research experiences. The poster display will include select images that highlight student perspectives.

We aim to share these findings with faculty and program administrators in order to increase understanding of student experiences and, as is consistent with the goals of photovoice as a form of participatory action research.

Funding Source: Mellon Initiative
Studying in Azores with the Rhode Island School of Design: Landscape Sketching, Traditional Craft, Sustainable Design, and Woodworking

Dinda Lehmann*, Dr. Laura Briggs

The Azores Islands are an autonomous region of Portugal located in the middle of the Atlantic Ocean. São Miguel is the largest of the islands and at 39 by 10 miles across, it is easy to notice the effect of humans on the ecosystems. São Miguel is covered with diverse landscapes including cow pastures, vast forests, rocky coasts, black sand beaches, and volcanic hot springs.

Rhode Island School of Design (RISD)’s program, Azores: Walk and Work with Wood, is an architecture and design class. By studying the islands through lenses of history, political science, biology, economics, architecture, and art, students gain an understanding of the many human and biological systems. Students hiked through diverse urban and natural areas while making observations by drawing landscapes. Each student designed and built a sculptural or functional piece inspired by the Azores landscapes using local materials and traditional techniques. These pieces were shown at the local art festival, Walk & Talk Azores. The piece that I created was made of Cryptomeria wood by using natural oil stain, a ginger lily fiber vessel, volcanic basalt, as well as other found objects. The piece represents the human-environment relationship in Azores.

Two of the main building materials we studied were the Cryptomeria japonica (Japanese cedar) and Hedychium gardnerianum (Kahili ginger lily). Students learned about the sustainable lumber industry and reforestation policies on the island as well as the different grades of Cryptomeria wood. There are new efforts to plant more endemic juniper species and other native species. The government has programs to reduce the invasive ginger lily. Because the ginger lily currently has no economic use, the University of Azores is making bio fiber prototypes out of the invasive ginger lily. These bio fibers are used to create biodegradable containers that serve as an alternative to plastic or Styrofoam.

What I have learned on this program has helped me better understand the importance of using sustainable materials in design and to consider various applications for these materials. Using local materials is very important, especially on an archipelago as isolated as the Azores, because it reduces the carbon footprint of importing materials as well as outsourced labor. Sustainable design is something that I hope to learn more about, continue in my work, and share with my audience as a studio artist.
RAICES: Connecting the Roots of People

Francisco Macias*, Katsuo Nishikawa, Ph.D.

Being a first-generation Mexican-American student witnessing a time of great Latino oppression and persecution gave rise to a determination to fight for Latinos. With the support of Trinity and the MAS program, I was able to intern for an organization that is dedicated to this fight. RAICES is a nonprofit agency that provides free and low-cost legal services to underserved immigrant children, families, and refugees. My opportunity to serve mi Raza came with working under the RAICES’ detention legal team, or better known as “FAM D”. As a Karnes Pro Bono legal intern I worked specifically with immigrants that were undergoing the process of asylum while being detained at Karnes County residential center. The guidance and mentorship provided by Fam D, allowed me to grow as a young professional that is also globally conscious. With great thanks and pride in my heart, I must say, La Lucha Sigue!

Funding Source: Mellon Initiative, Kay Smith Jordan ’64 Endowment Fund, & Alvarez Internship
The Function of Geography and Socioeconomic Variables in Loan Success

Jeysel Huezo*, Dr. Huston

Microlending programs are known to be associated with providing credit to underserved populations that are financially marginalized by conventional financial institutions. Community development financial institutions collect and track loan repayment data to assess the economic impact and sustainability of their operations. Through a dataset from LiftFund and econometric tools, this study explores the role of geography and socioeconomic variables in loan success at the local level. Using multiple regression analysis, we find that the probability of loan default is affected by geographic location and race. More specifically, statistically significant coefficients are found for African American-owned businesses and startups.

Funding Source: McNair Scholars Program
SkateCuff Summer Experience

Andrew Koob*, Luis Martinez

SkateCuff's Mission is to assist the movement of alternative forms of transportation, and making them into a more legitimate form of transportation. This is accomplished through a lock designed specifically to fit the profiles of these different vehicles. This provides security by allowing the user to lock up their vehicle to any closed, fixed object such as a bike rack. Using properly treated steel, and a well-tested design, we provide more security and more ease of use than any other skateboard lock on the market, and will soon expand to use this technology on other forms of personal electric vehicles.

Funding Source: Trinity Entrepreneurship
Developing High Noon

Kathleen Creedon* and Theresa Ho* with Dr. Jennifer Bartlett

Everything about making High Noon – marketing, editing, design – was about cultivating a place for stories about moments when future confronts the past and celebrating the differences in our stories. But creating such a community raises important conversations about what it means to be diverse, accessible, and unique.

High Noon had four large goals for the summer. We wanted to find fresh new voices from communities that are under served, under represented, and/or unfairly presented in media. We wanted to come up with ways for High Noon to be a literary journal that is even more accessible for readers, writers, and artists than the average literary journal. We wanted to look for ways we could create partnerships with other departments at Trinity University as well as organizations around San Antonio and the greater Texas area. And we wanted High Noon to become financially self-sustainable.

Funding Source: Entrepreneurship Department
The Sylph as a Mouthpiece: Exploring the Influence of Ballet-Inflected Language on Non-Ballet Spheres in 19th-Century England

Lauren Rawlins*, Dr. Betsy Tontiplaphol

Our research investigates the pervasiveness of ballet culture in 19th-century England and explores its unsung impact upon the period’s writerly imagination. As a small segment of this research, we are examining the usage of specific descriptive language and imagery consistently associated with famous ballerina Marie Taglioni within non-balletic affiliated areas of British writing and culture. To this end, we have curated sources from the British Periodical database ranging from 1820 to 1850 and developed criteria for evaluating and differentiating among the various cultural connotations of our focus terminology. These criteria qualify each search hit and determine the presence and degree of balletic inflection. We are hoping to demonstrate that when 19th-century British writers utilize our target descriptors and imagery within specified connotations, they are drawing upon the cultural capital of ballet as a medium to convey their thoughts and ideas, which in turn illuminates the centrality of ballet and highlights its shaping effect on language.

Funding Source: Mellon Initiative
Examining How Rap Music Criticizes Political Environments in Russia

Isabela Vazquez*, Mary Lynne Gasaway Hill, PhD, Andrew Chapman, PhD

In November of 2018, a high-profile artist, Dmitry Kuznetsov, known as Husky to his audiences, was arrested for “hooliganism” after performing for forty-one seconds on top of a car amidst a crowd of fans. Originally scheduled to perform at a venue in Krasnodar, his performance was cancelled when prosecutors warned the venue owners they considered Husky’s act to be “extremist”. He is a rapper who is known for lyrics mocking the government and drawing attention to police brutality, and openly critiqued President Vladimir Putin in one of his earliest songs, “7th of October.” His arrest was highly publicized throughout Russia, calling to attention the censorship of artists in the country.

My research project translates and analyzes lyrics in Husky’s song, “7th of October,” named after the Russian Federation President Vladimir Putin’s birthdate. The song sparked a mass wave of controversy due to its sensitive topic. My translation, the first ever in English, will attempt to capture the figurative language used to create double meaning in his lyrics. The power of language and its manipulation is what can make the rap genre such a powerful act. The importance of how the translation is done is imperative because it sets up the analysis of how this song acts as a form of protest, against Putin himself, but also extending to the current state of the Russian Federation.

Using Renovated Speech Act Theory posited by Gasaway Hill and Critical Discourse Analysis (CDA), emanating Bakhtin, I analyze the song to reveal how critiques against President Putin also extend to socioeconomic concerns in the country. My methodologies were chosen, as they assert that texts, language, and communication should always be considered in their social context because they inform their wider audiences of the nuances going on around them. I have conducted background readings of Russia’s musical history starting from the Stalinist period to the present day, which informs a deeper social context analysis and comparative points with how other musicians engaged in social critique. The goal of this project brings attention to how rap music is being adopted by Russians as their own form of resistance and way to criticize their government for its wrongdoings.

Funding Source: St. Mary’s University, Summer Undergraduate Research Fellowship
Evaluating the Effects of Body Location on Hair Cortisol Concentration in Marmosets

Evelyn Bartling-John * and Dr. Kimberley Phillips

Glucocorticoid hormones, including cortisol, are involved in a number of physiological processes including the conversion of sugar, fat, and protein stores into usable energy and the inhibition of swelling and inflammation. Glucocorticoid hormones, including cortisol, are regulated by the hypothalamic-pituitary-adrenal (HPA) axis. Thus, quantification of cortisol provides a valid, non-invasive, retrospective biomarker of hypothalamic-pituitary-adrenal (HPA) axis activity and individual health. As cortisol is deposited into the hair shaft over time, hair cortisol provides information of HPA activity over a period of weeks or months. Common marmosets (Callithrix jacchus) are a valuable research model in neuroscience and aging research due to their adaptivity, physiological characteristics, and ease of handling. Analysis of long-term HPA activity is frequently desired; thus it is essential to obtain valid and reliable measurements. Previous research on chimpanzees suggests that hair cortisol varies between the following body locations: side, arm, and back (Yamanashi et al., 2016). Because researchers may collect hair from different body regions, we must determine if hair cortisol concentration varies depending on the part of the body in marmosets. In this study, we collected hair from the backs and tails of nine (9) common marmosets during annual health screenings (male \( n = 3 \); female \( n = 6 \)).

Samples were processed, washed, dried, and ground to a fine powder using a Retsch Mixer Mill (MM 440) following our previously validated methods (Phillips et al., 2018). Our next steps are to do methanol extraction and enzyme immunoassay to determine cortisol concentration. Once these hair cortisol concentration data are obtained, we will analyze via paired samples t-test to determine if there are significant differences between the two body locations. These results will direct future hair collection protocols.

Funding Source: Trinity University Neuroscience Program
An Account of the Self

Linda Ready*, Steven Luper

This paper suggests that we abandon the idea of a criterion for personal identity and replace it with an account of the self in terms of psychological connectedness. This term was pioneered in Derek Parfit’s essay Personal Identity in which he claims that what matters in survival can have degrees. I define the self in a way that allows us to break away from the traditional notions of an enduring identity factor and introduce identity in degrees of direct psychological relations.

Funding Source: McNair Scholars Program
Philosophy for Children: Philosophy in Praxis

Anja Bjeletich*, Judith Norman

Since Matthew Lipman’s creation of the Institute for the Advancement of Philosophy for Children in 1972, philosophers have thought about how to engage children in philosophy, which is typically viewed as elite knowledge. This research project is an attempt to develop a Philosophy for Children program that can be implemented through Trinity University’s Philosophy department. This project allows students and professors to work with the local community and give back to San Antonio, while also encouraging 3-7 grade students to think critically, develop reasoning skills, and ponder philosophical concepts on their own level. Our Philosophy for Children program focuses primarily on reading typical children’s literature, such as Arnold Lobel’s *Frog and Toad* stories, and encouraging children to extrapolate the philosophical viewpoint presented in the story. The children are then asked to discuss and reason through the argument presented by the story. Reasoning and analytical skills are crucial to a child’s development, especially during these early years, and our program seeks to aid in the development of these skills. Our sample class lasted for one day, and we ran three lesson programs. In the first, we asked the children to define the concept of personhood and apply it to the nature and animals. In the second, we asked students to create a Utopian society based on a list of values they generated and believed ought to be upheld by society; and in the third, we had students reason through the nature of art while attempting to depict abstract concepts or emotions in their own artwork. The ultimate goal of this project was the allow children access into the philosophical world, teach reasoning and critical thinking skills, and encourage students to develop a level of autonomy and self-expression that is not typically found in conventional grade schools.
Speech Emotion Recognition with Two-Dimensional Grading

Fan Lee*, Albert Xin Jiang

Some studies in this field have been released in the past few years. In this project, the task is training the AI with more humanize labels in the dataset. Instead of classifying data in only four emotions like the previous studies, happy, sad, neutral, and angry, only two attributes are considered when labeling. One is from negative to positive, and the other is from passive to active. Each data would be giving a score for each attribute from 1 to 5. Training the machine in a more human-like logic would help it evaluate the speech more accurately. By taking the best approaches from the previous researches, the deep neural networks (DNN) are built with convolutional neural networks (CNN), and long short-term memory (LSTM) in a recurrent neural network (RNN) architecture. The project runs on Google Colaboratory using Keras on top of TensorFlow for optimizing the speed. The data is in German and labeled by the same person for fairness.

Funding Source: Computer Science HEP (Howland-Eggen-Pitts) fund
Racial Inequalities in Infant Mortality in U.S. Counties

Hana Kruger*, Benjamin Sosnaud

Historically, the infant mortality rate (IMR) has declined in the United States as medical technology has improved. However, even with these improvements, the United States maintains one of the highest rates amongst developed countries. Racial disparities are a large driver of this high rate, as children born to black mothers are about two times more likely to die within the first year than children born to white mothers.

Previous studies have used major regions (e.g. northeast, southwest) of the United States as the unit of analysis (Chen et al. 2014), finding regional IMR patterns. However, when examined at the state level (Sosnaud 2019), these same patterns do not hold, highlighting the need for a more focused analysis within states to identify variables that contribute to infant mortality disparities between black and white infants.

Using the National Center for Health Statistics’ linked birth-death records spanning from 2003-2014, we conduct a cross-sectional analysis of 434 U.S. counties with at least 20 black and white infant deaths in this time period. We first document variation in the magnitude of racial disparities in infant mortality across counties. We then consider institutional variables such as hospital facilities and health and human services-focused non-profits within the county as possible predictors of racial disparities in infant mortality.

Funding Source: Murchison Fellowship
Invisible Threads

Kirsten Timco*, Rachel Joseph

My research fell into two tracks: the process of my own playwriting as I develop a full-length script and the artistic process of playwriting as we develop preliminary research for a book on playwriting. We attended Teatro Potlach’s Intercultural Festival of Laboratory Theatre Practice. Through participating and observing the wide range of workshops as well as performing in Invisible Cities and Rachel Joseph’s Antigone in the City, there is applicable artistic value in assuming several roles within the production and performance processes. Filling a diverse array of positions can prove beneficial to the playwriting process while increasing overall knowledge in the Performance Studies field.

Eugenio Barba’s masterclass provided intense insight towards the creative process by using Pablo Picasso’s process as a metaphor for the artist’s journey. Picasso started with a single dot, and created his work from that point, each individual dot creating new possibilities for the spectator. This metaphor creates a parallel for the playwright, encouraging a faithfulness in one’s beginning and using that as a veritable segue. Teatro Potlach and Pino du Buduo’s Invisible Cities displayed the complexity of dramaturgy alongside artistic direction. Du Buduo’s careful dramaturgy reminds the playwright to be deliberate and three-dimensional; to write with more than just dialogue in mind so that the spectator, too, can see the invisible.

These experiences provide a new, versatile skillset that applies to playwriting in the following ways: (1) thorough character development, (2) drafting, and (3) creating an authentic connection with the audience. These techniques, uncovered through experiential learning, can assist in adopting an empathetic approach to Performance Studies, which is crucial to producing impactful and believable art.

Funding source: Mellon Initiative
**Heliospheric Pickup Ion Surveys with the Hot Plasma Composition Analyzer of the Magnetospheric Multiscale Mission (MMS-HPCA)**

*Zoe Vanover*, Vanover, Z. E.¹, Gomez, R. G.¹,², Fuselier, S. A.², Cardenas, R.¹

1 St. Mary’s University, One Camino Santa Maria, San Antonio, TX 78228
2 Southwest Research Institute, 6220 Culebra Road, San Antonio TX 78238

The Magnetospheric Multiscale Mission Hot Plasma Composition Analyzer (MMS-HPCA) is designed to determine the role of plasma composition in magnetic reconnection through measuring the velocity distribution functions of the ions in the plasma. Magnetic reconnection is a fundamental means of energy transfer from the solar environment to that of the Earth through magnetic field coupling. Recent observations outside of Earth’s magnetosphere have demonstrated that HPCA is well-suited for measuring the velocity distribution functions of interstellar and inner source pickup ions. Interstellar pickup ions enter the solar system in a neutral charge state. Neutral atoms with trajectories near the Sun come under its gravitational influence and are focused downwind of the Sun to a distance which depends on their mass. Interactions within the solar radiation environment ionize the interstellar neutrals which are subsequently picked up by the interplanetary magnetic field (IMF). Inner source pickup ions are created by interactions between solar radiation and sources within the solar system which are located between the Sun and Earth. While their creation processes are similar their dynamics are very different, and these differences are visible to HPCA, making the ion populations distinguishable. Inner source ions are also interesting because while their existence is established, their respective source or sources are still unidentified. Determining the nature and location of these sources is of central import to this research.

Funding Source: Summer Undergraduate Research Fellowship
Her Truth: Gender, Sexual Violence, and Credibility in 13 Reasons Why

Kailey Lopez*, Dr. Sarah Erickson

The question of who is to be believed in cases of gendered violence and what, in fact, constitutes such violence has been a major topic of discussion in the era of #metoo. In this project, an in-depth analysis of the Netflix series 13 Reasons Why (one of the most discussed TV shows of 2017 and 2018) was conducted with a focus on abusive behaviors, scripts, and schemas as well as a particular emphasis on the ways in which belief, truth, and gender intersect. This presentation will identify the frequency of occurrence of gendered violence and abuse in the popular narrative. It will also discuss whether the show treats experiences and one’s truth differently based on gender, emanate differences in credibility between men and women, and explain how this translates into the routine dismissal of women’s emotional and physical experiences. By highlighting the subtler ways in which women’s experiences of gendered violence are undermined in narratives such as 13 Reasons Why, this work provides a theoretical framework and methodological template for future similar investigations. Ultimately, although this narrative does provide a complex depiction of sexual violence, it largely reinforces problematic narratives about this violence and upholds traditional tropes about gender, credibility, and truth.

Funding Source: Mellon Initiative
Ethical Applications of Trauma Theory to Art Historical Inquiry

Ariel del Vecchio*, Michael Schreyach

This project examines the moral inconsistencies inherent to the field of trauma studies and proposes an ethical application of such a theory to works of art. The field of trauma theory is relatively young but already has major rifts in its conceptualization of trauma. This project surveys the field of trauma studies and addresses the issues inherent to skeptical theoretical models of trauma and trauma development. I survey the work of Scarry, Caruth, Sontag, Reed-Gavish, Hacking, and Leys to arrive at a trauma informed approach to art historical inquiry. This project values the testimonial quality of art as a vehicle to articulate violence and human suffering on both a deeply personal and political level. I argue that the ethical application of trauma theory to the analysis of art of violence and trauma is of the upmost importance to effectively articulate the content of trauma art as clearly as possible. This project sheds light on the necessity for both trauma theory and art historical inquiry to, first and foremost, conceptualize all theoretical and analytical subjects as human.

Funding Source: Murchison
Holocaust Representation Through Two Contemporary Graphic Memoirs

Allyson Young*, Dr. Victoria Aarons

Post-Holocaust generations have continued the legacy of Holocaust memory, most recently in the form of graphic novels. This continued transmission of memory is especially important with the end of direct survivor testimony. In my oral presentation I will introduce two contemporary graphic memoirs: *Flying Couch* by Amy Kurzweil, the granddaughter of survivors; and *Belonging* by Nora Krug, the granddaughter of Nazi perpetrators. Both graphic novels are coming of age stories, in which the autobiographical narrators go on journeys of self-exploration and discovery as they attempt to situate themselves in their respective larger history. Both enter the legacy of their families’ past through physical objects, places, and oral stories. While neither Kurzweil nor Krug have all their questions answered, they both reach a point in which they come to terms with their place in their larger history. In this way the creation of their graphic memoirs is therapeutic, a way to release the past, to embrace the present, while keeping the promise to never forget, and keeping alive the stories and lessons of their grandparents.

Funding Source: Mellon Initiative
First and Second-Generation Immigrants Stories:  
Their Attitudes Towards Migrants in San Antonio, Texas

Victoria C. Abila*, Dr. Aloisi, Dr. McGuire

This work aims at furthering the extensive research by anthropologists on first and second-generation immigrants’ attitudes towards more recent immigrants. Thus far, the literature has shown that the development of attitudes toward immigrants is constantly changing and context-dependent and that these attitudes will shape the context of immigration reception and the future of intergroup relations. This research aims to answer the question of how (or if) immigrants living in San Antonio have come to negotiate boundary-making between themselves and newer immigrants. This study utilizes in-depth interviews with first and second-generation Americans now living in San Antonio, Texas, one of the largest receiving communities of migrants in the country. The working hypothesis is that San Antonio’s long-term immigrants' attitudes will be influenced by generation and that within the younger, second-generation immigrant group, there is a small shift towards warmth in welcoming newer immigrants. Anticipated influencing factors include: ethnic attachment, religious values and affiliation, and political leanings. The respondents’ stories of experiences that changed their attitude or shifted how they felt about others may add nuance to our understanding of how generation affects immigrants’ identity in relation to newer migrants.

Funding Source: McNair Scholars Program
The Image of Asylum Seekers in San Antonio, Texas

Rachel Poovathoor*, Dr. Sajida Jalalzai

During this past summer (2019), the United States have witnessed a dramatic influx of migrants attempting to cross the U.S.-Mexico border. I have experienced the effects of this border crisis up-close while working with the Interfaith Welcome Coalition (IWC), a non-profit based in San Antonio that provides humanitarian aid to migrants and at-risk immigrant populations. My primary role as an intern has been to use communication methods to increase the name-recognizability of IWC in order to further their volunteer-led efforts and increase item/monetary donations made to the organization. I have done this through interviewing volunteers and asylum seekers, curating an online social media presence, and reorganizing the organization’s website. This work has increasingly led to me interact with asylum seekers and IWC volunteers, so much so that I have taken on the role of a Lead Volunteer on Monday nights at the local Migrant Overnight Shelter. With the public debates about the lives of these migrants, the rights they may or may not have, and their fate, IWC and their efforts have been highlighted in the local and national news. The humanitarian work that IWC does along with the organization’s online presence directly impacts the image of asylum seekers in the eyes of the rest of the American public. My presentation will address my contribution to this image and the implications it may have on the border crisis at large.
Creating a Professional Theatre Production: From Research to Performance

Kristen Herink* (Trinity ‘21), Alex Parris* (Trinity ‘20), and Dr. Nathan Stith

During the summer of 2019, students Alex Parris and Kristen Herink have been working closely with Dr. Stith on the pre-production work involved in creating a professional theatre production. Dr. Nathan Stith serves as the director of a professional production of Neil Simon’s Brighton Beach Memoirs at Oldcastle Theatre Company, a highly respected regional theatre located in Bennington, Vermont. Alex Parris, who serves as the production’s Assistant Stage Manager, has contributed to pre-production meetings with Dr. Stith and the design team and has embarked on research which examines the design of homes and home furnishings in Brighton, Brooklyn during the 1930s. This research assists the director and designers in creating a realistic depiction of 1930s Brooklyn. Kristen Herink, who appears as Laurie in the production, has been working with Dr. Stith providing dramaturgical research on Jewish culture and family dynamics in 1930s Brooklyn. This research assists both Kristen in her character development and Dr. Stith in creating the world of the play during rehearsals. In June, Dr. Stith, Alex and Kristen traveled to Bennington, Vermont to begin rehearsals. During the rehearsal process the students worked directly with Dr. Stith as well as union actors and stage managers from New York City, gaining invaluable experience and professional contacts. They will be able to take the tools they are learning to use in their theatre coursework and transfer those skills to a professional environment. The production, which will be reviewed by major newspapers throughout New England, will run during the month of July, and be seen by hundreds of theatre goers from New York, Boston, and New England. Alex and Kristen’s involvement in both the research that assists the creation of a professional production and the hands-on work during the run of a production provides insight into the production process and the integral role that research plays in the execution of theatrical works.
The Performative Rhetoric of Horace in the *Odes*

**Tiffany Nguyen**, Dr. Timothy O’Sullivan, Dr. Willis Salomon

In recent decades, there has been much scholarship on how the Roman poet Horace socially positions himself in his poetry; see especially by Ellen Oliensis (1998) and Michèle Lowrie (1997). Many of these scholars focus on Horace’s performance of self, the carefully constructed personae that takes on depending on audience and occasion. Particularly in his *Odes*, a particularly diverse body of poems that encompasses and incorporates a range of topics, including politics, banquets, love, and mourning, Horace’s personae can vary quite drastically from poem to poem, oftentimes in confusing or contradictory ways. While performance is social in nature, the *Odes* do not always work to develop Horace’s public self as a poet in relation to his patron, Maecenas, or the emperor, Augustus. Even in his most apparently public poems, Horace develops private selves as well; he expresses more private moments, such as love, mourning, and feelings of peace in quiet pastoral moments. Such performances typically assert a private life outside of others’ control in which Horace finds the freedom to write what he wants. In my paper, I work to examine how Horace establishes himself privately in order to ascertain how such these private performances serve him publicly as a poet within Augustan Rome.

Funding Source: McNair Scholars Program
The Digital Veil of Ignorance: Using Video Games to Create Immersive Thought Experiments

Nicholas Smetzer*, Aaron Delwiche

Through adapting John Rawls “Veil of Ignorance” thought experiment into a playable video game, this project aimed to demonstrate that video games can not only contain philosophical themes, but be utilized to explicitly impart philosophical lessons or exercise one’s philosophical positions. Veil Quest is a short, playable video game created by Nick Smetzer with the goal of teaching the player to make a better in-game world for all characters, not just your own.
My Summer Working at Tribu: Marketing and Beyond

Estefania Oviedo*, Dr. Martinez

In the following presentation I will be discussing my summer working at Tribu, a local Marketing and Advertising Firm. When first going into my internship I wanted to learn more about the agency life, how work culture is essential in reaching goals, as well as further develop my marketing and networking skills. With a positive attitude and an open-mind I was able to enjoy a great 10 weeks along amazing professionals who helped me grow a lot both as a marketer and a person.

Funding Source: Students + Startups and Tribu
Where Do Brown Anole Lizards Lay Their Eggs?

Abigail Dennis*, Laura Taylor, Olive Pertuit, Isabela Carson, Dr. Thomas Sanger and Dr. Michele Johnson

An animal’s embryonic environment can strongly affect its adult phenotype. In egg-laying animals such as squamate reptiles, it is therefore advantageous for females to choose nest sites with conditions ideal for offspring development. The soil moisture, temperature, and depth of a nest site can all impact offspring fitness; however, the extent to which each of these factors individually drives female nest site choice is unclear, especially since it is difficult to locate eggs in the field. To quantify the role of each of these factors in determining a female’s oviposition site, 35 wild-caught brown anole (Anolis sagrei) lizard females were given the choice of laying eggs in one of two “nesting boxes” containing moist soil; one box was placed over a heating pad controlled by a thermostat, and the other was maintained in ambient conditions. Soil moisture and depth measurements were taken for each oviposition site in both nesting boxes. In combination with previous studies of anole egg survival and hatching, these data can reveal whether natural selection has favored female nest site choice behaviors that increase offspring fitness, and allow us to more precisely quantify the ideal conditions for female oviposition.

Funding: Trinity University Biology Summer Undergraduate Research Fellowship (BSURF)
From Co-Founder to Launch SA Intern

Emily Hofman*, Dr. Luis Martinez

The purpose of coming to San Antonio and going through the Students and Startups program was to better understand the knowledge and experience behind a startup company. With no prior business experience, pursuing a degree in engineering, and a business partner who was as clueless as I, EaSy fitness was born. I was a cofounder of EaSy Fitness, a meal prep company. EaSy Fitness wasn’t meant to be but Students + Startups was an opportunity to explore my love for entrepreneurship.

I was open to work for any type of startup because I saw abundant opportunities for growth in all the partnering companies. Ultimately, I matched with a company named LaunchSA. I do not believe there could of been a better match. LaunchSA is a non profit organization that helps small business owners and entrepreneurs. This allowed me to not only become familiar with the resources that are available for business owners but also network with so many motivated people who shared my passion for entrepreneurship. I had daily tasks such as request assistance emails, phone calls, and helping walk-ins but I also organized volunteers for a four day event, San Antonio Entrepreneurship Week, and coded an online database/website that better organized needed demographics and allowed for an improved experience for the users.

Going through Students + Startups and working for a small business this summer opened my eyes to so many possibilities. I learned what it was like to work for a sustainable small business, I improved my communication skills, learned new coding languages, and built relationships with coworkers and business owners. With all that I have learned, I am excited to put it back into the world. The chance to move to a new city and meet it’s welcoming people made my summer experience one to never forget.

Funding Source: Students + Startups and Launch SA
Evaluating the Effects of Co-Contaminants Ethanol and Nitrate on BTEX Biodegradation Using a Multi-Species Numerical Model

John Koellmann*, Brady Ziegler

Four, single well, push-pull tests were conducted in a wetland near Bemidji, MN to study the impact of ethanol and nitrate as co-contaminants on the biodegradation of benzene, toluene, ethylbenzene, and xylenes (BTEX). Injection solutions for the four tests included BTEX, BTEX and ethanol, BTEX and nitrate, and BTEX, ethanol, and nitrate, respectively. Each injection solution included a conservative tracer. The four wells were sampled over 63 days to monitor how ethanol and nitrate affected BTEX biodegradation. To quantify biodegradation rates, we simulated data from the present push-pull tests using a multi-species reactive transport model (PPTEST). PPTEST allows the user to investigate physical transport processes, sorption, and microbial reaction kinetics from single well push-pull test data; it is an improvement over estimating reaction rates with analytical approximations as it allows arbitrary-order and user-defined reactions to be modeled. For example, an analytical evaluation of the field data from these tests could be interpreted to suggest that BTEX was produced in the aquifer over the course of the experiments because BTEX concentrations remained high relative to the conservative tracer. However, PPTEST shows that this apparent production is an artifact of differential transport of BTEX and the tracer. Additional analysis of the data indicate that the presence of ethanol plays a complex role in the physical and biogeochemical processes that affect overall BTEX concentrations. For example, since BTEX is more soluble in ethanol than in water, we hypothesize that ethanol acts as a solvent for BTEX, increasing aqueous concentrations. In addition, since ethanol is microbially preferred over BTEX as an electron donor, ethanol is likely consumed prior to BTEX biodegradation, and as ethanol is consumed, the solubility, and therefore aqueous concentrations of BTEX, decreases. Ethanol concentrations decrease more rapidly in the presence of nitrate due to thermodynamic controls, which likely decreases the solubility of BTEX and inhibits biodegradation. The results of this study will be useful for understanding the role of co-contaminants in the biodegradation of BTEX in a variety of anaerobic electron accepting conditions. Findings from this study are important for understanding the water quality impacts of fuel spills as the addition of ethanol to gasoline becomes more common.
Extreme Mass Accretion in Young Stars

Kelli Jackson*, Cole Grisham*, Sofia Rascoe, Dr. David Pooley

In the process of formation, stars gain mass by accreting it from their surroundings. Some young stars are known to go through a transitory phase of rapid accretion know as an FUor outburst, named after the prototype object FU Orionis. During these outbursts, the stars have the highest mass accretion rates known among star-forming objects. Most models of FUor outbursts employ a greatly enhanced accretion rate from a circumstellar disk onto the stellar surface, increasing from the typical accretion rate by a factor of $10^{–1000}$. This type of event could play a large role in setting the conditions for planet formation, but the basic mechanism by which it happens is still unclear. X-ray and optical-IR observations during the burst could be key in understanding these events, but until recently the initial outburst phase had been unobserved in X-rays. Reduction and analysis of Chandra X-ray Observatory data from three different FUor objects is presented. The X-ray spectra are fit with a hot plasma model that takes into account the absorption of photons by intervening gas. We have discovered evidence of an emission line from iron on one of the FUors; the origin of the iron emission is unclear but may lead towards a better fitting understanding of FUor behavior.

Funding Source: NSF, NASA
"Supersoft” X-ray Quasars & their Spin

Brian Guerrero*, Dr. David Pooley

"Supersoft” X-ray quasars are supermassive black holes that are actively accreting large amounts of material and whose X-ray spectra are dominated by low energy emission. Such a spectrum may indicate that the emission is dominated by a thermal component from the accretion disk around the black hole. Modeling such a spectrum can provide valuable constraints on the size of the inner edge of the accretion disk, which depends on both the mass of the black hole and its spin. Typical quasar spectra have contributions from both a thermal disk component and one or more non-thermal components, often modeled as power laws. There are usually degeneracies between these spectral components, limiting the constraints on the accretion disk parameters that we can obtain from broadband X-ray spectral modeling. However, these supersoft X-ray quasars may be completely dominated by the thermal disk component, offering a rare and rather unique opportunity to obtain strong constraints on the size of the accretion disk and therefore the spin of the black hole.

There are only a few dozen supersoft X-ray quasars for which X-ray data exist. We present results from modeling Chandra X-ray Observatory data for these supersoft X-ray Quasars. The spectral fitting has allowed us to constrain the accretion disk parameters, in particular the black hole spins and sizes of the innermost stable circular orbits. When combined with independent mass estimates from optical spectroscopy, this research may provide an avenue to tightly constrain the spins of these black holes.
Gravitationally Lensed Super-Massive Black Holes

Jack Braley*, Naim Barnett*, David Pooley

Einstein's theory of general relativity explains how the spacetime-bending effects of a large mass can also lead to a bending of the path that light takes around a massive object; in effect, the massive object's gravitational field can be thought of as a lens. When we are lucky enough to find the chance alignment of a distant, massive galaxy in front of an even more distant source of light such as a quasar (a supermassive black hole), there is the possibility of the massive galaxy gravitationally lensing the light from the quasar and forming multiple images of the quasar. Quadruply-imaged gravitationally lensed quasars are extremely useful because they provide a large number of constraints on the properties of the lensing galaxy. Using 37 Chandra X-ray observations of the quasar Q2237+030, we have constructed a twenty-year-long X-ray light curve of each image of the quasar by first finding the total energy fluxes of all four images combined through spectral fitting and then determining the contributions of each of the four individual images through image fitting. When combining all data together, the spectrum shows evidence of a relativistic iron line, from which we can deduce the spin of the black hole. This analysis is the most in-depth to date of this quadruply-lensed quasar and will be used to set constraints on the matter content of the lensing galaxy and the structure of the supermassive black hole’s accretion disk.

Funding Source: Murchison Summer Research Fellowship
Art School: Learning How the Arts Are Financed

Connor Helsel*, Kate Ritson

This summer I worked as the Grants Intern at Artpace, San Antonio, a position in which I realized just how much good that granting foundations do in our world. It would be remiss to not mention that I could not have gotten this position, working with an arts non-profit, without Trinity University’s support this summer. The Arts, Letters, and Enterprise program works to provide nonprofits with paid interns that wouldn't otherwise have funding for such an internship, leveling the playing field and helping businesses and students. At Artpace, almost the entire staff are artists themselves. Such care for arts facilitates fantastic levels of consideration and drive in the office. I received an education on the processes of grant writing and in doing so learned much more than I bargained for. The process started with grant research at the San Antonio Area Foundation and then moved into helping to draft grant requests and managing active grants. My work left me with new connections, more knowledge on San Antonio than I imagined, and the confidence to know that I have the skills to work in any office setting.

Funding Source: Arts, Letters, and Enterprises Minor
Digital Archives and the Keyword Search: How History Gets Found

Nathaniel Pigott*, Dr. Gina Tam

The digitization of historical archives has given historians a powerful new tool: the keyword search. In this project, I use my work with newspaper databases in Hong Kong as a case study to examine the process of digital historical research using keyword searches in library databases. By using my research experience as a template, I conduct a meta-analysis on the process of historical research, exploring the kinds of stories it is possible to tell using the keyword search, and analyze the limitations that persist despite technological advances.

To this end, I first plan on explicating the design of databases and search algorithms to illuminate, from a technical standpoint, how the keyword search influences the kinds of sources historians collect. Then, building on existing literature on this topic and using my research experience as a case study, I will highlight three ways in which the keyword search has made archival research more powerful: decentering the archive and centering the individual, allowing historians to trace particular words and concepts, and being an inherently recursive methodology of research—doing keyword searches tends to generate new keywords for further searches.

Finally, I will analyze how particular mediums, like newspapers, government documents, and oral histories, necessarily privilege particular events and particular points of view, and show how the keyword search can amplify these biases, generating search results with patterns not based in actual historical phenomena.

Funding Source: Mellon Initiative
Impact Jones

Adalyn Sedano*, Luis Martinez

I am a participant in Students + Startups, an international internship program that introduces promising students with promising startup companies in and around downtown San Antonio. The matching process involved interviewing with a handful of mutually-compatible startups. As a business management and human resource major, I was able to find a home with Innocenti Jones, a law firm that helps entrepreneurs and growing companies get started, develop, and protect themselves. My partner company enabled and encouraged me to discover the downtown San Antonio ecosystem while developing my administration and human relations skills.

My internship position with Innocenti Jones covered a wide range of tasks. Although the primary tasks included document revision and customization, it also included visiting client’s companies and discovering the passion of SA entrepreneurs. From the onset of the internship Attorney David Jones, my supervisor, was invested in my professional and personal development. Throughout the summer we centralized my tasks and projects based on my learning objectives. We focused on administration and management concepts, such as research and networking. Working with David and my co-intern Daria Galbraith, I was able to accomplish my learning objectives and then some!

This presentation will cover the last 10 weeks of my summer- who I have met, what I have been working on, and how I have grown as a professional and as a person.

Funding Source: Students + Startups partnership between 80/20 Foundation, Trinity University, and Innocenti Jones, PLLC
Somehow I Manage: An Intern’s Look at Expectations

Kathleen Gekiere*, Dr. Carl Leafstedt

The Arts, Letters, and Enterprise program creates opportunities for students to gain valuable work experience in San Antonio businesses and nonprofits. Throughout this summer, I have had the opportunity to work for 3 different organizations, learning a wide variety of skills and engaging with a wide-reaching network of passionate people in San Antonio, as well as working within three distinct structures and management styles. In general, I pursued internships based upon my interest in environmental work, and while each organization was linked to my primary interest of nature, I was soon learning more about workplace environments than ecological spaces. None of the working environments were consistent across all three organizations; in one, all members worked remotely on specific assignments, in another, work was conducted through meetings across town featuring vague project discussions, and the third had a more traditional office with clearly defined tasks.

With each internship, I simultaneously developed my individual skills and caught an inside view of the wide variety of professional interactions and management styles, and how I, as an intern and employee, can best operate within these systems. With the Monarch Butterfly and Pollinator Festival, I became a networking and organizational fiend, attending meetings and events while organizing any and all information. With Burnam Gray, I worked on the fly with social media outreach for Texas Infectious Disease Readiness (TXIDR), website design for the Louise Batz Foundation, and initiatives to define the vision of charitable organizations to their stakeholders and the public for multiple nonprofits. With The Nature Conservancy, I jumped in the field, collecting, entering and proofing data, as well as learning how to relate the everyday work of a nonprofit employee to the larger mission of the organization. Through all these experiences, I learned most about myself, how I work, and how to become my own advocate in the workplace. In my presentation, I will detail my experiences at each internship, with special attention to managing my own expectations and discerning other’s expectations of me despite varying leadership styles and work environments.

Funding Source: Arts, Letters, and Enterprise program
A Natural Perspective: Interning at The Nature Conservancy

Jacob Jesielowski*, Jacqueline Ferrato, and Dr. James Shinkle

Over my ten-week internship at The Nature Conservancy, I not only witnessed the variety of career paths I could pursue with an environmental studies degree but also added to my knowledge of research methods and the scientific process in both the field and the office. Within the company I worked primarily as an aid to one of The Nature Conservancy’s Field Biologists, Jacqueline Ferrato working across Texas monitoring TNC properties and ensuring land conservation. This presentation will highlight the skills I have acquired and how this knowledge can be applied to my future professional career.

Part of this new understanding comes in the form of developing my research skills. Over the course of the internship I traveled across Texas to several Nature Conservancy properties aiding the field biologists in their research. I both observed and performed several new data-collection methods required to properly monitor the protected sites such as measuring canopy cover. Additionally, I had the opportunity to run an urban ecology research project under my supervisor’s guidance. Together we met with managers from the city parks to discuss our research proposal and where we could set up our wildlife cameras within their parks. This experience revealed the professional process for conducting research and sharpened my current skills as a researcher. While in the office, I gained experience in software normally used at environmental company while learning about the variety of jobs available to me within the field. The combination of these experiences revealed the constantly changing nature of this field, requiring consistently sharp skills while moving between the outdoors and the office. Then they connect the two sides to produce results to be used by governments and companies alike to protect the natural world.

Funding Source: Arts, Letters, and Enterprises Minor XE
Competitive Sorption of Florescent Dye and Groundwater Contaminants on Granular Activated Carbon

Lummus, Malisse*; Ziegler, Brady; Schindel, Geary

Dye tracer tests using granular activated carbon (GAC) offer a semi-quantitative method to passively detect dyes in water flowing through wells, springs, and streams. GAC is used to sorb fluorescent dyes used for tracing groundwater flow paths in karst aquifers. One concern regarding dye tracer tests is that natural and/or anthropogenic contaminants in aquifers may compete for sorption sites on GAC, potentially leading to non-detectable results for dye on GAC during passive tracer tests; this may lead to incorrect interpretations about groundwater flow paths. This study aims to investigate whether natural and anthropogenic contaminants affect the sorptive capacity of dye onto GAC.

Laboratory experiments using 3D-printed mixed flow reactors were used to simulate the flow of dye and sorption competitors (tannic acid, bicarbonate, and TCE) in the natural environment. Approximately 2 g of sieved GAC (2.00–1.70 mm) were placed inside a mixed flow reactor, and standard solutions of fluorescent dye were injected into the mixed flow reactor using a syringe pump with a constant injection rate of 0.5 mL/min for two and a half hours. After two and a half hours, sorption competitors (tannic acid, bicarbonate, and TCE) were injected into the mixed flow reactor using the same injection procedure. Control experiments were also conducted with deionized water following the dye injection. Dye was extracted from the GAC and analyzed using an ultraviolet visible spectrophotometer. The same procedure described above was followed in subsequent experiments in which the contaminant was injected into the mixed flow reactor prior or simultaneously to the dye.

We expect the results of these experiments will provide insight into the competitive sorption that fluorescent dyes may experience in tracer tests conducted in the field. Analyses of the contaminant-first injection will demonstrate whether or not contaminants can occupy sorption spots, inhibiting sorption of dye. Analyses of the dye-first injection will demonstrate whether or not dye is desorbed from GAC due to competitive sorption with contaminants.

Funding Source: Trinity Geosciences Department, McNair Scholars Program
Drought-Tolerant Food Forests as a Solution to Climate-Fueled Food Price Volatility

Ian Dill*, Dr. Greg Hazleton

This project explores funding opportunities, organizational support, and agricultural expertise to create drought-tolerant food forests in San Antonio. The impending impacts of global climate change provide a narrow window to build resiliency to food price spikes caused by increased frequency of droughts. The best academic research and expert opinion on the subject points to drought-tolerant food forests as the optimal way to orient urban agriculture in the American Southwest towards water conservation while also increasing local access to fresh fruits and vegetables. Through academic research and engagement with various regional partners, we are exploring avenues to launch a pilot project which will act as a model for local urban farmers seeking to diversify their crop selection.

Funding Source: Hixon Environmental Studies Fellowship
Dsmodels in Action

Kenneth McLaren*, Seth Fogarty, Eduardo Balreira

The package dsmodels is a Domain-Specific Language developed for the R language that encompasses many techniques needed for the computation and mathematical analysis of discrete dynamical systems. Among other things, dsmodels has the tools to investigate the long run behavior of these systems such as when they settle into a stable orbit and the length, or period, of those orbits. This summer, we worked on two projects to refine and improve this package.

First, we looked at the Feigenbaum constant, which describes the frequency of the parameters that cause the period of orbits to double, called a period doubling bifurcation. For one dimensional systems, this is known and we verified the computational accuracy of dsmodels by computing the Feigenbaum constant and comparing our results to the known values and to similar computations with other programming languages. Using this experience, we developed techniques to search for two dimensional analogues of the Feigenbaum constant which are not yet known to exist.

In a second project, we used dsmodels to gain insight into the proof of a conjecture for periodic maps. Namely, the composition of two maps without periodic orbits will be a map without periodic orbits. We tested this by generating random maps and checking their composition for periodic orbits. While this computer approach with dsmodels does not provide a proof for this conjecture, it can be used to find counterexamples.

Funding Source: Murchison
Economic Phase Diagrams: Visualization and Simulation

Nicholas Smoker*, Seth Fogarty

Dynamical systems are mathematical models used to capture the relationship of a quantity’s current value to its value in the next timestep. Economists, particularly macroeconomic theoreticians, use such models to study the impact of changing economic conditions on economic variables. When visualized, using a two-dimensional plane and some representation of motion, such macroeconomic models are termed phase diagrams. Phase diagrams are frequently used to study stability, i.e., whether a government’s deficit will rise uncontrollably or will eventually stop growing. Stability is characterized by the presence of fixed points, which are points at which both dimensions of the plane will cease to change between timesteps. In a stable model, every point in the model is attracted to a fixed point.

We adapt dsmodels, a programming language written to allow easy simulation and visualization of dynamical systems, to the needs of phase diagrams. In doing so, we encounter several challenges. These include systems that are only partially stable; finding the location of fixed points that cannot be found through simulation; and the automatic generation of isoclines, curves which show the points at which one dimension will not change between timesteps. We improve dsmodels to allow it to meet these challenges, and become a more useful tool for economists.

Funding Source: Department of Computer Science Summer Undergraduate Research Fellowship
Trace Element Mobilization in a Crude Oil-Contaminated Aquifer

Jones, Katherine*, Ziegler, Brady, and Cozzarelli, Isabelle

Reduction of ferric (Fe(III)) hydroxides is an important electron accepting process within a crude oil-contaminated aquifer near Bemidji, MN, USA. Fe(III) hydroxides commonly sorb trace elements in aquifer sediments; when they are reductively dissolved, trace elements can be mobilized into groundwater. Previous studies have shown that arsenic (As) is elevated in groundwater of the Bemidji plume due to this mechanism. New analyses of spatial distributions of other trace elements in groundwater (nickel, cobalt, rubidium, molybdenum, barium, strontium, and zinc) show similar spatial distributions to dissolved Fe and As, suggesting that they may also be mobilized due to Fe(III) reduction.

In this study, we use new (2019) and previously collected (2013-2016) groundwater and sediment samples from the aquifer to assess the extent of trace element mobilization due to oxidation of hydrocarbons coupled with Fe(III) reduction. Sediment samples were digested using concentrated nitric acid at 180° C and analyzed for trace elements using inductively coupled plasma-optical emission spectrometry (ICP-OES); groundwater samples were analyzed using ICP-mass spectrometry.

Mobilization of trace metals associated with iron reduction was determined via mass balance models. Results show depleted concentrations in sediments adjacent to the oil body due to mobilization during Fe(III) reduction and enriched concentrations at the anoxic/suboxic transition zones due to sorption onto freshly precipitated Fe(III) hydroxides. These results will help evaluate the risk of long-term secondary groundwater contamination from naturally occurring trace elements at oil-contaminated sites.

Funding Source: Hixon Environmental Studies Fellowship
How To (Posthumously) Do Things With Words: Speech Acts in Latin Epitaphs

Andrew Tao*, Dr. Tim O’Sullivan

Unlike modern tombs, funerary monuments in the Roman period were intended to be encountered and viewed by people passing by. Tombs were located alongside major roads leading out of cities such that anyone walking on these roads could come across the tombs, stop and read their epitaph, and participate in prolonging the memory of the deceased. The placement of tombs in frequented areas explains why many epitaphs employ language designed to directly address readers and capture their attention. In this way, epitaphs allow the deceased to interact with the living and have a posthumous impact on the world. In this paper, I will use speech act theory to show how speech acts contributed to the effect epitaphs had on their ancient audience. Speech act theory, a concept stemming from philosophy of language, has mainly been applied to literary contexts within the field of Classics, and only a few approaches using it to look at epitaphs exist. In particular, I will focus on issues such as what types of speech acts are common in epitaphs, how speech acts elicit interaction between the passerby and tomb, and what the relationship between “speaker” and “addressee” looks like in this non-traditional, funerary context. In the end, I argue that epitaphs, through language, contributed to the overall ability of funerary monuments to have a real impact on their audience and allow the Romans to, in a sense, live on after death.

Funding Source: McNair Scholars Program
Las Abuelitas y Sus Obras de Amor: Material Culture and the Hidden Histories of Latinas’ Creative Work at La Trinidad United Methodist Church

Jamiless Lopez*, Dr. Angela Tarango

My research will focus on the material culture that is produced by the women of La Trinidad United Methodist Church. While digitizing the archives of the church, Dr. Tarango and I found a wealth of photo albums relating to the material objects that women made for the church, mainly, incredible handmade quilts, the liturgical banners, and miniature quilts donated for premature babies at University Hospital. These particular ministries are an important creative outlet in the church, particularly for the older women. Women’s work, and particularly the material culture of women tends to be overlooked in religious histories. While current scholarship acknowledges religion’s importance in transforming the significance of material objects, cases like these abuelitas’ labors of love are only described broadly in theoretical terms. In order to see how these acts of service to the church serve as creative outlets within Christian ministry and as ways to perpetuate and cultivate forms of Mexican American material culture, we have interviewed the women in the banner-making groups and the women in charge of maintaining the church’s history room. Through photographic documentation, I have captured the ways in which these women create the banners hung in their church but also make sure their church’s history remains alive through the objects stored in their history room. From this, I will create an online exhibition and public history that will be accessible to all and linked to the La Trinidad’s website. The products created for the community and the hours the volunteers spend organizing photo albums are an additional method in which these Methodist women can serve their Lord. The sewing groups transform the space inside the sanctuary with the handmade banners they meticulously produce and that revitalize the worship that takes place at their church. Similarly, the objects maintained by the history room’s volunteers are symbols of the church’s history that remains relevant and flourishing through the archives, photographs, and plaques stored. What role do material objects have in establishing the identity of the women in the groups as Methodists? How does the church’s history and material artifacts shape its 21st century identity? How has the church come to see itself as a piece of “Holy Ground”?

Funding source: Ronald E. McNair Scholars Program
Actor, Traveler, American: Exploring Intercultural Communication in Theatre

Leah Woehr*, Dr. Kyle Gillette

The role of intercultural communication within a theatrical context is often overlooked by its participants. In theatre, the desire to complete a production can overshadow exploration of the interpersonal dynamics during the creative process. While studies of intercultural theatre exist, such as the work of directors like Eugenio Barba, the nuanced exchanges of intercultural collaboration require further exploration. My presentation, “Actor, Traveler, American: Exploring Intercultural Communication in Theatre”, provides a personal perspective on the process of creating a performance for an intercultural audience and the experience of working and learning among artists with diverse backgrounds. This is based off of my experience at Teatro Potlach’s Festival Laboratorio Interculturale di Pratiche Teatral (FLIPT) in Fara in Sabina, Italy. In this presentation, I will discuss experiences such as performing in an original work, Antigone in the City, participating in Teatro Potlach’s performance, Invisible Cities, and viewing works presented by other international theatre groups. I will juxtapose my experiences with this theatre company with literature such as Ian Watson’s Negotiating Cultures: Eugenio Barba and the Intercultural Debate. I will also draw upon ideas about travel and the city from Italo Calvino’s Invisible Cities in order to reflect on how cultural identity is used and developed. In this presentation, I argue that one must be in touch with their own cultural roots, both in theatre and in travel, in order to explore other traditions. However, this requires an attitude of cultural curiosity, rather than an imperialist mindset of learning. By exploring the nuances of intercultural communication within theatre firsthand, this project is intended to serve as a guide to enlighten travelers and actors alike.
Educating Muslim Leaders in North America

Arisha Ali*, Sajida Jalalzai

Our research this summer will contribute to a book length project about the education of Muslim leaders in accredited North American institutions. Currently, the only accredited programs that train Muslim leaders in the United States and Canada are Protestant Christian seminaries. Based primarily on ethnographic research conducted at Hartford Seminary (Hartford, Connecticut), Emmanuel College of Victoria University in the University of Toronto (Toronto, Ontario), and Bayan Claremont (Claremont, California), this project analyzes impact of multifaith educational models on the development of North American Muslim leaders, such as Muslim chaplains, pastors, and spiritual caregivers. What are the rationales provided by these historically Christian institutions for the establishment of Muslim leadership training programs? What are the logics of Muslim students pursuing their education in these multifaith settings? What are the translations to make these distinct religious communities comprehensible to each other? This project contends that the aforementioned programs result in the inculcation of norms of Muslim authority that align with liberal Christian values, including but not limited to: religious individualism, spirituality (versus legalism), democracy, non-hierarchical forms of authority, ecumenism, and interfaith relationship-building.

Funding Source: Mellon Initiative

Jordan McMurry*, Jun dos Remedios*, Dr. Christina Cooley

In order to generate an efficient detection assay, an analyte’s signal must be amplified to provide a detectable readout in a short time period. Polymerization reactions can be used to amplify a signal by inciting formation of a long polymer off of a single initiator molecule. In order to detect the appearance of polymers, and thus the presence or absence of an analyte, the Cooley lab uses fluorogenic monomers that are dark in their monomer form, but glow under UV light when integrated into a polymer. An effective detection assay must not only produce a detectable signal quickly, but also achieve as much fluorescence as possible in order to detect extremely low analyte concentrations. We have previously developed a standard reaction which can successfully be used for analyte detection, but in order to optimize for rate and overall brightness, a better understanding of the components of the reaction and how they affect the mechanistic and kinetic aspects of polymerization is needed.

Using fluorescence and kinetic data, several variables of the reaction were researched, analyzed, and tested in order to optimize the reaction. Various surfactants were screened and characterized to find the optimal choice for solubilization and kinetic efficiency in the reaction. In addition, we focused on components of the reaction that had a direct connection to the catalyst’s functionality- testing conditions such as the halide salt type and concentration, amount of reducing agent, and the concentration of the catalyst itself-- since the polymerization rate is based on the equilibrium between the catalyst’s activator and deactivator state. Other variables, such as pH and the presence of oxygen, were also probed to determine their effects on the polymerization kinetics. Each component was thoroughly tested to find the amount and type that would increase the rate and overall brightness the most while minimizing any background polymerization for samples without initiator, thus constituting the best detection assay.

Funding Sources: Welch Foundation, Trinity University, American Chemical Society Petroleum Research Fund, San Antonio Area Foundation, Murchison Research Fellowship
Development and Use of a Dual-Balance Linear Quadrupole Trap as a Micro-Analytical Tool for Probing the Rheology of Levitated Model Sea Spray Aerosol Particles

David S. Richards*, Kristin L. Trobaugh*, Josefina Hajek-Herrera*, Ryan D. Davis

Atmospheric aerosol particles play a large role in climate and air quality. Sea spray aerosol (SSA), transferred to the atmosphere via bubble bursting at the ocean surface, represent a large fraction of naturally-occurring aerosol particles. Thus, understanding the physico-chemical properties of SSA is therefore of extreme relevance towards understanding atmospheric and climate processes. SSA is known to have a large organic fraction in addition to the inorganic components of ocean water. The organic fraction can include biologically-derived saccharides, among other compounds. In controlled laboratory studies, compounds found in SSA can take on a wide range of physical states, including glassy and gelatinous. For example, aqueous monosaccharide aerosols are known to exist as ultra-viscous or glassy particles, dependent on the relative humidity (RH). However, a comprehensive understanding of the rheological properties (such as viscosity) of mixed organic-inorganic aerosol particles remains lacking. In particular, the role of gel formation is poorly understood because the solute concentration in aerosol micro-environments can greatly exceed what is possible in a bulk solution. New micro-analytical techniques are thus necessary to fully explore the rheological properties of aerosol particles under atmospheric conditions.

Here, we present observations of hydrogel formation using a new experimental technique developed to probe the micro-rheological properties of levitated aerosol particles and explore gel formation in aerosols. In order to experimentally characterize the viscosity and gel structure of various organic-inorganic mixtures in aerosol form, electrostatically induced collisions of levitated droplets composed of known saccharide-salt composition were performed using a dual-balance quadrupole trap (DB-QT). In addition to the existing DB-QT currently in use, a new design was fabricated. Charged aerosol droplets were radially confined within the quadrupole trap where counterbalance electrodes then vertically levitated the droplets in a contactless environment. With the inclusion of two counterbalance electrodes, droplets of opposite polarity were trapped and equilibrated under a given RH and then subsequently merged. The viscosity and/or phase of the droplet was then determined by various optical imaging techniques. We demonstrate that aerosols that contain both organic and certain inorganic salt components can exist in a gelatinous phase that only forms in the unique environment offered by microdroplets. The technical details of our newly developed micro-analytical technique will be discussed along with the micro-rheological results.

Funding Source: Murchison Undergraduate Research Fellowship, Welch Undergraduate Fellowship, Trinity University startup funds
Role of the Metal Support Interface and Particle Size in H₂ Activation on Supported Gold Nanoparticles

Alex Bradley*, Allison St. John*, Dr. Bert Chandler
Department of Chemistry, Trinity University, San Antonio, Texas 78212

Global Hydrogen production exceeds 50 million tons per year, largely for ammonia synthesis in the production of nitrogen fertilizers. Given its technical importance, developing a fundamental understanding of hydrogen activation is vital for designing new catalysts. Hydrogen is thought to activate homolytically on late transition metals, but recent evidence suggests that it activates heterolytically at the metal-support interface of supported gold catalysts.

This study utilized a Van’t Hoff analysis of H₂ oxidation kinetic measurements to determine thermodynamic properties associated with hydrogen binding and activation over supported Au catalysts. The thermodynamic values determined were ΔH = -23 ± 5 kJ/mol, ΔS = 50 ± 10 J/mol*K for the Au/TiO₂ catalyst, and ΔH = -51 ± 8 kJ/mol, ΔS = 140 ± 60 J/mol*K for the Au/Al₂O₃, which are different from the values found in the literature on non-gold catalysts. The entropic difference likely stems from the heterolytic activation of hydrogen, leaving a proton on the metal oxide support with a higher degree of freedom than a hydride on a metal center. Taking advantage of gold’s thiophilicity, we also developed a cysteine / Ellman’s reagent titration to evaluate Au particle size with UV-visible spectroscopy. These two techniques were combined to determine how particle size affects the reaction kinetics and H₂ binding thermodynamics.
Energetics and Interfacial Interactions of Spliceosomal Protein Dib1 Predicted with MD Simulations


The spliceosome is the highly dynamic macromolecular complex responsible for catalyzing the removal of introns from pre-messenger RNA. The spliceosome consists of five small nuclear ribonucleoproteins, as well as several additional proteins. As part of the spliceosome’s assembly pathway, the essential protein Dib1 must leave before the spliceosome becomes catalytically active. Experimental analysis has found a temperature sensitive phenotype of Dib1 (dib1-F85A) that hinders splicing activity. This phenotype has also been hypothesized to perturb spliceosome assembly. Our current work uses atomistic molecular dynamic (MD) simulations to study the molecular interactions surrounding Dib1 within the spliceosomal B complex. With this methodology, we are able to determine what energetic and structural changes result from this point mutation.

Starting with recently published cryo-EM structures, the B complex of the spliceosome was reduced to only include components in close proximity to Dib1 (either native or mutant). The reduced B complex structure consists of three snRNAs (U4, U5, and U6) and four proteins (Prp6, Prp8, Brr2, and Prp31). Both systems, containing either native or mutant Dib1, were simulated using atomistic MD simulations to identify energetic differences between native and mutant reduced B complexes. The simulation conditions mimicked the biological conditions of previous bulk splicing assays, with an aqueous solvent, 0.1 M salt, and temperature differences that have experimentally shown dib1-F85A inactivation. The MD simulations revealed a decrease in global binding energy and interfacial hydrogen bonding in the dib1-F85A system compared to the native Dib1 system. The results from the MD simulations support the experimentally observed temperature sensitivity in the dib1-F85A system and could provide molecular mechanisms for spliceosomal assembly when dib1-F85A is present. Future studies include analyzing different spliceosomal complexes and calculating the Gibbs free binding energy with the MM-PBSA method.

Funding Sources:
NIH-NIGMS
(R15GM120720, Maeder, C.)
Robert A Welch Foundation
(Maeder, C. and Trinity University Chemistry Department)
National Science Foundation
(NSF-1531594, Cheng, K.)
Trinity University Murchison Fund
(Goldstein, R., Orr, G.)
Arnold and Mabel Beckman Foundation Beckman Scholars Program
(Schreib, C.)
Synthesis and Characterization of Modified Cucurbit[n]urils

Lois Warden*, Adam Urbach

While synthetic receptors are currently used for a wide range of applications, such as protein purification and chemical sensing, their success can be improved upon through their chemical derivatization. This strategy is used by chemists, biologists, and in nature to add novel functionalities to molecules. We aim to use this approach by conjugating small molecules to a robust and non-toxic synthetic receptor to increase the number of potential applications in the field of supramolecular chemistry. The current state of our synthetic and physical-organic studies will be presented.

Funding Sources: Trinity University, National Science Foundation, National Institutes of Health, Welsh Foundation
Understanding the Dissociation of D₂ and H₂ on Metal Catalysts Using IR Spectroscopy

Isabelle Pacheco*, Caroline Darbro*, Dr. Chris Pursell

Gold is typically thought of as an inactive catalyst when it comes to hydrogenation reactions. However, recent discoveries have proven that supported gold nanoparticles can be highly selective in oxidation and hydrogenation reactions. For example, supported gold nanoparticles are able to hydrogenate α,β-unsaturated aldehydes to the unsaturated alcohol in preference to the saturated aldehyde or saturated alcohol.

Several theoretical studies suggest that hydrogen activates heterolytically at the metal-support interface of supported gold catalysts. In concurrence to this theory, we have observed hydrogen reacting on the metal nanoparticle with protons forming new species on the metal oxide support. In order to further understand the activation and dissociation of hydrogen on supported metal catalysts, IR spectroscopic experiments were carried out on Au/TiO₂, Au/Al₂O₃, Au/ZnO, and Pt/TiO₂ catalysts. Each catalyst was exposed to H₂ or D₂ at a set temperature and pressure and IR spectra were collected in time.

While the evidence of a temperature dependence was inconclusive, we did notice a difference between the behavior of supported catalysts with small nanoparticles versus those with large nanoparticles. The smaller nanoparticles proved to increase the rate of the reaction when compared to the larger nanoparticles. This difference in the reaction rates is mostly due to the small nanoparticles allowing more surface area for the reactions between the gas and the catalyst to occur. These results prove that supported gold nanoparticles with small nanoparticles are more active towards the activation and dissociation of D₂ and H₂.

Funding Source: Welch Foundation
Probing the Reactivity of Copper-Containing Redox Proteins

Zachary Acevedo*, Laura Hunsicker-Wang, Ph.D.

The electron transport chain is a series of protein complexes that couple electron shuttling with proton pumping in order to create an electrochemical gradient. The gradient is then utilized by ATP synthase to create ATP and energy for the cell. The first redox site of the terminal complex, Complex IV, from the *Thermus thermophilus* bacteria has been isolated as TtCuA. TtCuA’s redox center contains two copper ions, in distorted tetrahedral environments, that are bridged by two cysteines and ligated by two histidines and two weak axial ligands. H157 of TtCuA, a solvent exposed ligating histidine, and the two non-ligating histidines have demonstrated modification by diethyl pyrocarbonate (DEPC), an exogenous chemical modifier that can modify primary amines, deprotonated histidines, and tyrosines. The modification of TtCuA’s histidines by DEPC does not show pH-dependence, indicative of fast proton exchange between the solvent and the histidine nitrogens favoring modification over deprotonation. The H157 adduct does appear to be removed over 48 hours at room temperature, as supported by mass spectrometry, electrochemistry, and visible CD spectroscopy. This is one of two adduct removals observed, indicating the lability of bonds with the H157 Nε. It is possible this nitrogen is involved in proton pumping through Complex IV. During 48 hour exposure to DEPC, one of the non-ligating histidines undergoes a Bamberger cleavage and at least 10 non-histidine associated modifications by DEPC occur. These modifications decrease the protein’s pI.

In order to more closely model a modification that could occur *in vivo*, TtCuA was exposed to 4-hydroxynonenal (HNE), an endogenous lipid peroxidation product that is associated with multiple metabolic and neurodegenerative disorders and that is known to modify histidine, lysine, cysteine, and arginine residues. Exposure of TtCuA to 20 equivalents of HNE appears to reduce the protein over 48 hours. Less of an effect is seen with fewer equivalents. Modifications of TtCuA by HNE have been observed by mass spectrometry. Exposure of the *Pseudomonas aeruginosa* Azurin protein, a mononuclear blue-copper protein that has a redox site nearly identical to TtCuA in the denitrification chain, with HNE does not reduce the protein despite modification. *P. aeruginosa* Azurin also does not have a ligating histidine modified by DEPC.

Funding Sources: Trinity University Chemistry Department, Mach Research Fellowship
Chemical Characterization of Amber and Plant Exudates

Natasha Muppala,* Adviser: Dr. Joseph B. Lambert

Amber—an organic gemstone that has been admired for its range of colors and beauty and been widely sought after throughout history—has had a broad range of uses. It has been used to create jewelry and a variety of decorative objects, as a therapeutic agent in folk medicine, and as a source of ancient preserved fossils. Amber is an organic material that is derived from the resin of trees and can be found all over the world. We are able to study amber that has been fossilized for millions of years, as well as relatively younger forms of the substance, like plant exudates and resins, through the use of nuclear magnetic resonance spectroscopy (NMR). NMR spectroscopy distinguishes five separate categories (Group A-E) of amber fossils and plant resins, through the analysis of characteristic peaks and spectra. These NMR fingerprints allow us to categorize the ancient tree source of the resin and the possible location where the botanical sources existed. The three spectroscopic techniques that we have employed in this study to characterize samples of amber and plant exudates chemically are carbon-13 ($^{13}$C) spectra of solids, one-dimensional (1D) proton ($^{1}$H) spectra of solutions, and two-dimensional (2D) solution spectra of the type known as COSY.

Funding Source: Welch Foundation (Departmental Grant No. W-0031)
Expression and Purification of Proteins Relevant to Superoxide Detoxification

Katherine Barondeau*, Daniel Ocampo*, Chenyi Wang*, Dr. Jason Shearer, Dr. Abigail Songok

Superoxide, a harmful reactive oxygen species (ROS), is degraded by enzymes before it can cause cellular damage. Most commonly degraded by superoxide dismutases (SODs), which catalytically disproportionates superoxide into hydrogen peroxide and dioxygen, superoxide is also less commonly degraded by superoxide reductases (SORs), which reduce superoxide into hydrogen peroxide. There are five known classes of SODs, one of which is NiSOD, which is commonly expressed in aquatic microorganisms. SOR, an iron containing metalloenzyme, is only found in a limited number of anaerobic archaea. There are several questions concerning the mechanism by which NiSOD and SOR disproportionate superoxide. To gain insight into this mechanism of superoxide detoxification by these enzymes we have taken a two pronged approach; we have prepared mutants of NiSOD and a metalloprotein-based model of SOR. Mutants of NiSOD were chosen in such a manner that key residues that are predicted to be important in the superoxide disproportionation mechanism. The metalloprotein-based SOR model was designed to be easily modifiable so one could tease out key structure/function relationships important in its superoxide reduction mechanism. Presented are initial studies aimed at preparing these systems. A 4-α-helical bundle that will coordinate iron in a similar manner as SOR as well as mutants of NiSOD were expressed in *E. coli* and subsequently purified. The catalytic efficiencies of these enzymes were assessed using the xanthine/xanthine oxidase assay. In addition, attempts at trapping out metal-nitrosyl species, which mimic a metal-superoxide adduct, were also undertaken.
Supramolecular Studies of Intrinsically Disordered Peptides

Nia Clements*, Adam Urbach

Pharmaceutical science has been advanced primarily based on designing small molecule ligands to target proteins with well-defined structure. Recently it has become clear, however, that the function of many proteins relies on regions that lack intrinsic structure. Such intrinsically disordered proteins present a major challenge to the drug design paradigm because they do not present a well-defined structure to which to design a target drug. This presentation will describe recent efforts to target intrinsically disordered proteins and peptides and to understand the relationships between disorder and binding.

Funding Sources: Trinity University, The Welch Foundation
Synthesis and Evaluation of Prodrugs for Targeting Disease

Tyler Bate*, Christopher Fan*, Dr. Christina B. Cooley

Prodrugs are prevalent in present-day drug design, and the majority of prodrug protecting groups are used to enhance drugs’ bioavailability. The design of prodrugs that utilize different delivery systems is a promising therapeutic strategy that may reduce off-target effects and provide localized therapy.

The activation of the transcriptional ATF6 arm of the unfolded protein response (UPR) has been shown to be a viable therapeutic strategy to combat ischemia and reperfusion in cardiac cells. Recently, a small-molecule activator, AA147, was discovered in a screening study to specifically activate the ATF6 arm of the UPR. Attaching different functional groups on the phenol of AA147 prevents activation of the ATF6 pathway until the protecting groups are cleaved by intracellular enzymes or biomarkers such as reactive oxygen species (ROS). Therefore, synthesizing different prodrugs should improve the delivery of AA147 to damaged tissues, and prevent cellular damage. We will discuss the synthesis of AA147 and different prodrugs of the molecule, as well as their biological activity in living systems.

Funding Source: Murchison Undergraduate Research Fellowship, Welch Foundation, Trinity University, American Chemical Society Petroleum Research Fund, the National Science Foundation
Hammett Studies on Supported Au Nanoparticle Catalysts

Mary Bajomo*, Jennifer Sample*, Dr. Bert Chandler

The activity of different types of supported Au catalysts is greatly affected by the electronic properties of the nanoparticle. Our group previously used benzyl alcohol oxidation Hammett Studies to examine the electronics of Au nanoparticle active sites on different metal oxide supports. In this project Hammett Studies are employed to characterize the electronics of Ni-Au and Cu-Au bimetallic catalysts using 1-phenylethanol oxidation as the probe reaction. Para substituted analogs of 1-phenylethanol and acetophenone (the reaction product) were calibrated using gas chromatography, employing decalin as an internal standard. 1-phenylethanol concentration studies examining the reactivity of several supported Au catalysts (Au/TiO₂, Au/Al₂O₃, Au/ZnO, Au/SiO₂) were also performed, and showed that the reaction was largely insensitive to the reactant concentration. We began performing Hammett studies with several of the monometallic catalysts and are extending this work to the bimetallic materials.

Funding Sources: Murchison Fellowship, Welch Foundation, National Science Foundation, Research Corporation
Universality in Kinetic Models of Circadian Rhythms in *Arabidopsis thaliana*

Yian Xu*, Orrin Shindell

Adapting to the 24-hour light-dark cycle caused by the rotation of the Earth, plants have evolved sets of chemical reactions that control their circadian rhythms. Over the past 15 years, researchers studying these circadian reactions have developed eleven distinct chemical kinetic models based on genetic feedback loops for the common laboratory plant *Arabidopsis thaliana*. Each model is a system of coupled nonlinear ordinary differential equations. We perform a dynamical systems-based analysis on these models and find they are all situated near a mathematically special point where small changes of one parameter leads to dramatic changes in the behavior of the system. This suggests that there may be some biological significance corresponding to this mathematical property.

To illustrate the special nature of these systems, we numerically compute the solutions to the kinetic models for *Arabidopsis thaliana* using MATLAB. Separately, we perform a weakly nonlinear analysis valid in these special systems to predict the amplitude and frequency of the oscillating chemical species. By scaling the computed frequencies and amplitudes of the chemical concentrations by our theoretical predictions, we show that the solutions to all these models collapse into a universal parameter-free form. We further comment on some implications of our result for improving future modeling efforts.
Utilizing Click Chemistry to Enhance the Solubility of Aromatic Compounds in Aqueous Media

Joseph Anderson*, Prof. Christina B. Cooley

Classical methods of attaching sulfate functional groups to aromatic compounds may be employed to increase the water solubility of hydrophobic molecules. However, these methods utilize dangerous reagents and when reacted with our compound of interest, 2-amino anthracene, result in a zwitterion, which is difficult to purify and react in following synthesis steps. Our current method utilizes sulfur (VI) fluoride exchange (SuFEx), a new application of click chemistry, to latently solubilize the anthracene methacrylamide monomer. Sulfonyl fluorides are stable functional groups which are compatible with the synthesis steps of the anthracene monomer and can be converted into a sulfate group with ease at the desired time to increase the water solubility of the aromatic compound. Our progress towards developing a water soluble fluorogenic monomer will be discussed.

Funding Source: Welch Foundation and American Chemical Society Petroleum Research Fund
Creating Receptor Binding Sites by Selective Enzymatic Processing

Anna Van Zile*, Adam Urbach

Affinity tags are added to proteins for purification purposes, but can alter the natural structure of the protein if they are not removed. Specific binding sites for proteases can be added between the affinity tag and the natural sequence for enzymatic cleavage of the affinity tag; however, this approach can leave behind extra residues and decrease the yield of the purified protein. We aim to create an N-terminal affinity tag using selective protease inhibition. The design and current state of achieving enzymatic inhibition will be presented.

Funding Sources: Welch Foundation, National Science Foundation, National Institutes of Health, Trinity University
Emergence of Quantum Chaos in a Four Body System

Cooper Johnson*, Nirav Mehta

According to a well-accepted, but yet unproven conjecture by Bohigas, Giannoni and Schmit, a classical system that exhibits chaotic dynamics will have a so-called “Wigner-Dyson distribution” of nearest-neighbor quantum-mechanical energy level spacings. We present numerical calculations to study the emergence of quantum chaos in a system of four interacting atoms moving in one spatial dimension. We implement the method of “slow variable discretization” (SVD) to solve the Schrödinger equation for all four-body bound states. The SVD method we implement treats the hyper-radius (a measure of the overall size of the system) as a “slowly varying” parameter. This parameter can then be discretized using the “discrete variable representation” (DVR) technique, which guarantees our numerical approximations will converge to being exact. We calculate the bound state energy levels of the quantum system, and analyze the statistics of the nearest-neighbor energy level spacing to observe the degree of quantum chaos in the system.

Funding Source: Murchison Fund
Traffic Jam: Measuring the Glass Transition in a Dense 2D Colloidal Fluid

William Moore*, Dr. Orrin Shindell

Glasses are a non-crystalline solid state of matter that can form from a dense liquid when the particle density in the liquid increases past a critical value. The transition from liquid to glass is characterized by a divergent viscosity. We have developed a novel experimental system for analyzing the glass transition in two dimensions. We use a fluid supported lipid bilayer (SLB) on glass incorporates protein adhesion molecules that bind small lipid vesicles to the surface. The vesicles are constrained to remain in the plane of the SLB but are free to move laterally. By modifying the density of protein molecules, we control the particle density of the fluid. Using fluorescence microscopy to track fluorescently-labeled tagged vesicles as they diffuse, we measure the mean squared displacement and calculate the viscosity of the sample. We report our measurements of viscosity as our system approaches the glass transition and further comment on possible super-resolution experiments to determine the static distribution of particles in the static glass state.

Funding Source: Murchison Fellowship
Bimetallic Characterization Using $O_2$ Activation and Selective Hydrogenation

Natalia Gonzalez*, Rochelle Hand*, Bert Chandler

The addition of heterometals to Au nanoparticle catalysts can alter catalytic activity. In the case of 1-alkyne partial hydrogenation, NiAu bimetallic catalysts showed significantly higher alkene selectivity and comparable activity to pure nickel catalysts. In an effort to further understand the effects of Ni on Au, we are developing new routes to Ni@Au/MO$_x$ catalysts, utilizing supported NiO particles as the catalyst precursor. We are also developing a new probe reaction to rapidly evaluate catalytic $O_2$ activation. The reaction, inspired by work in the Cooley Lab, examines the reaction between 4-nitrophenylboronic acid (4-NPBA) and activated oxygen on the catalyst surface. The reaction is followed with UV-Vis spectroscopy, monitoring the absorbance of the 4-nitrophenolate ion.

Funding Sources: Trinity University (Semmes Scholar), National Science Foundation, Welch Foundation
A Supramolecular Approach to Affinity Controlled Release

Erin Cha*, Brylee Lavoie*, Cristina Hofman, Adam Urbach

New approaches to drug formulation are needed to control the pharmacokinetic properties of protein-based drugs, which are susceptible to denaturation using traditional controlled release methodology. This project aims to gain control over the rate of drug release using the extraordinary properties of the synthetic receptor cucurbit[7]uril (Q7). Matrices comprising Q7-modified network polymers have been synthesized and evaluated. The current state of the project will be presented.

Funding Sources: National Institutes of Health, Welch Foundation, Trinity University
Describing Ultracold Molecular Collisions

Alyson Laskowski*, Nirav Mehta

Ultracold molecules provide an opportunity to study phenomena and processes arising from molecular collisions with unprecedented energy resolution. Unfortunately, \textit{ab initio} calculations of collision cross sections and reaction rates remain beyond reach of current computational methods and hardware. Collisions of ultracold diatomic molecules are characterized by a deep potential energy well at short range, with a shallow long-range tail that prevails to large molecular separations. At the low collision energies characteristic of ultracold systems, the collisional properties are insensitive to the \textit{details} of the short-range physics. Therefore, the short-range properties of the collision can be encapsulated into (in the simplest approximation) a single parameter that depends only weakly on the energy. The long-range physics can be treated efficiently by analytical or numerical calculations. We will present models that make use of this efficient separation of length scales to treat real properties of ultracold molecular collisions.

Funding Source: Murchison Research Fellowship
Effect of Rough Surface on Artificial Cell Adhesion

Thomas Baer*, Dr. Orrin Shindell

Eukaryotic cells are on the order of tens of microns in diameter and made of soft materials, which makes their motion strongly influenced by thermal forces. When in close proximity to a surface, interaction forces occur between the surface and cells in addition to the thermal forces from the environment. The combination of these forces determines the movement of cells in the environment. In the case of a smooth surface, the interaction forces are known, and the cell’s motion is well-modeled. However, in the case of rough surfaces, the interaction forces and their interplay with thermal forces have not been studied extensively. Toward that end, we experimentally observe thermal undulations in artificial cells interacting with a rough surface and compare them to thermal undulations in artificial cells on a smooth surface. Using that data, we determine the physical effects that a rough surface has on artificial cell adhesion.

Funding Source: Murchison Fellowship
Elucidating the Effects of Distal Charges on the Reduction Potential of the Rieske Protein

Rachel Lopez*, Mary Hogsett, Janett Muñoz, and Laura-Hunsicker-Wang

The Rieske protein plays a key role in both cellular respiration and photosynthesis, transferring electrons through their respective cytochrome $bc_1$ and $b_6$ complexes. The Rieske protein is characterized by a [2Fe-2S] cluster with one iron that is ligated by nitrogens from two solvent-exposed histidine residues while the other is ligated by the sulfurs of two cysteines. In the electron transport chain (ETC), the Rieske protein oxidizes ubiquinol and reduces cytochrome $c$, which transfers electrons between complexes III and IV. The Rieske protein has a pH-dependent reduction potential, with a low pH potential of +161 mV for Thermus thermophilus Rieske and two oxidized pK$_a$ values: 7.8 and 9.65.

Previous work has demonstrated that hydrogen bonds, solvent accessibility of the ligands, and the presence of nearby charged residues can impact the reduction potential of the protein. However, the full extent of this third element — how far from the cluster these charged residues can reside and still impact the reduction potential — has yet to be explored. Two types of mutants have been created to probe the effects of these distal charges. First, mutations removing positively charged residues were predicted to decrease reduction potential. Likewise, mutations removing negatively charged residues were expected to increase reduction potential. Each mutation either resides a unique distance from the cluster or produces a different change in overall charge, demonstrating the impact of each factor both individually and additively. Lastly, the pK$_a$ values of the histidine ligands were also expected to be inversely related to reduction potential.

Using pH-dependent UV-Visible spectrophotometry, the pK$_a$ values of these mutants were determined and correlated to these relationships. While the overall trend of pK$_a$ values increased as expected for the mutants that removed positive charges, confounding elements also appeared such as a third pK$_a$. Furthermore, E146R, a mutant that removed negative charges, also demonstrated increased pK$_a$ values — opposite to the hypothesized trend. New mutants that implement neutral to positive substitutions have been developed to explore if this phenomenon is observed in a different type of mutation. In addition, to address assumptions made concerning the change in overall charge in each of these mutants, charge ladders and capillary electrophoresis are being explored.

Funding Source: Murchison Summer Undergraduate Research Fellowship
Optimization of a Viral Construct Enabling Neuronal Depolarization with Red Light

Jullian Valadez*, Cole Williams*, Changming Zhou, and Dr. Gerard Beaudoin III

Optogenetics is the process by which a light-operated ion channel is expressed in neurons to enable photon-activation of action potential firing in neurons. This project identified mechanisms of innovation in the usage of optogenetics in selective activation of neural networks. Building on the work done previously with ChrimsonR, a red-shifted variant of ChannelRhodopsin identified by the Boyden lab from a novel microbe, we identified and optimized expression of the protein. Using epifluorescent and confocal microscopy, we compared GFP expression between original and optimized constructs of the plasmid by transiently transfecting the plasmid into HT22 cells, a murine neuronal cancer cell line. Optogenetic stimulation during electrophysiology confirmed expression of ChrimsonR, and evaluated the efficacy of the new plasmid. Adeno-associated virus produced with the new ChrimsonR plasmid was purified using an iodixanol density gradient centrifugation, dialysis, and anion-exchange chromatography. We are analyzing changes in mRNA expression using a quantitative polymerase chain reaction (qPCR) as the optimized expression plasmid may have increased mRNA stability and/or increased transcriptional efficiency. The purified adeno-associated virus will be surgically injected into mice to test the plasmids efficacy in vivo. Thus, we have created an optimized optogenetics vector that will enable optical control of two different inputs.

Funding Source: Funding Sources: McNair Scholars Program, Murchison Summer Research Fellowship, and Trinity University Start-up
The Effects of Dib1 C-terminal Truncations on Splicing Activity in *S. cerevisiae*

Nick Pittner*, Corina Maeder

Splicing, the removal of non-coding introns of pre-mRNA and the ligation of the remaining coding exons, is an essential process for eukaryotic life. As a crucial process, splicing defects are seldom beneficial; a number of genetic diseases have been attributed to splicing deficiencies. Better understanding of the molecular machine that facilitates splicing, the spliceosome, could potentially lead to enlightenment on such diseases. The spliceosome undergoes a number of conformational and compositional changes throughout the splicing process. Small nuclear ribonucleoproteins (snRNPs) make up the main body of the spliceosome, and the composition of the spliceosome changes throughout the splicing cycle.

Dib1 is a spliceosomal protein that exists within the U5·U4/U6 triple snRNP in the B complex of *Saccharomyces cerevisiae*. Dib1 is essential for splicing, and therefore survival, so it is not surprising that it is highly conserved throughout Eukarya. Dib1 is a small protein, only 17 kDa, yet it plays a large role in the B complex by blocking the spliceosome’s catalytic site from its position at the heart of the spliceosome. This activity could potentially help in stabilizing the spliceosome, as well as by inhibiting premature splicing events. Interestingly enough, Dib1 also possesses peptidase activity in that it cleaves its own C-terminal tail. This autocleavage functionality lead to the hypothesis that Dib1’s C-terminus is potentially important for the protein’s role in splicing. In this study, we examined the importance of the C-terminal tail of Dib1 in splicing. Multiple Dib1 tail deletions were generated using site-directed mutagenesis. Effects on growth and *in vitro* splicing was examined for these mutations in *S. cerevisiae*. Determining the purpose of Dib1’s C-terminal tail and autocleavage activity could be instrumental in elucidating Dib1’s overarching role in the spliceosome.

Funding Source: NIH-NIGMS [R15GMI120720], Welch Foundation
Investigating Protein-Protein Interactions of the PI-Phosphatase Fig4 Toward Insights into Fig4-Related Neurodegenerative Diseases

Imran Khan*, Bethany Strunk

Phosphoinositide PI(3,5)P2, a signaling phospholipid responsible for directing cellular membrane trafficking and regulating specific stress responses, is dephosphorylated by the lipid phosphatase Fig4. Fig4 N-terminal mutations that disrupt catalytic activity have been shown to paradoxically reduce levels of PI(3,5)P2 and are linked to neurodegenerative diseases such as Charcot Marie tooth disease type 4J. Fig4 is closely associated with its opposing kinase, Fab1, in the Fab1-Vac14-Fig4 protein complex and activates Fab1 through direct protein-protein interactions. Fig4 disease related mutants disrupt these interactions, leading to decreased association with the Fab1-Vac14-Fig4 complex. Moreover, yeast cells lacking Fig4 display impaired growth on rapamycin, a growth inhibitor, at 37 degrees Celsius. Interestingly, under the same conditions, Fig4 disease related mutants demonstrate resistance to rapamycin relative to wild-type Fig4. These data suggest that Fig4 disease mutants may confer resistance to rapamycin through interaction with yet unknown protein partners.

Through mass-spectrometry, we identified an interaction between Fig4 and Sip1, which is reduced in mutants that exhibit impaired growth on rapamycin. To test whether Sip1 is required for Fig4 dependent resistance to rapamycin at 37 degrees and begin uncovering the disease-causing mechanism behind Fig4 N-terminal mutations, we generated a yeast strain lacking both Fig4 and Sip1. We then tested the ability of different Fig4 mutants to grow on the rapamycin plate assay in the presence and absence of Sip1. Our preliminary data indicates the presence of Sip1 leads to impaired growth in the absence of Fig4, suggesting that there is a genetic interaction between Fig4 and Sip1. To continue investigating the molecular mechanisms underscoring Fig4 mutant-dependent growth phenotypes, we plan on preparing rapamycin growth assays with more mutant strains and conducting co-immunoprecipitation experiments.

Funding Source: Biology Summer Undergraduate Research Fellowship (BSURF)
Investigating the Autocleavage Activity of Yeast and Human Spliceosomal Protein Dib1

Danielle Jamison*, Zoe Bullock*, Garrison Meeks, Dr. Corina Maeder

Splicing of pre-messenger RNA (pre-mRNA) is a crucial aspect of eukaryotic life. Splicing removes the non-coding introns from the pre-mRNA transcript and ligates the coding exons to form a mature mRNA that can then be translated to create proteins. The spliceosome is a large, dynamic macromolecular machine composed of five small nuclear RNAs (snRNAs) and over 100 associated proteins that facilitates this process. To complete the splicing cycle, the spliceosome undergoes conformational changes to adopt at least seven distinct complexes. One complex of particular interest is U4/U6-U5 triple small nuclear ribonucleoprotein particle (triple snRNP) and its associated protein Dib1. Prior work showed Dib1 must leave the pre-catalytic spliceosome before its transition to the catalytically activated spliceosome, which can then go on to perform the two trans-esterification steps required for splicing. Dib1 is a 17 kDa protein composed of 143 amino acids. An intriguing characteristic of the human Dib1 protein is its ability to cleave its own C terminus in vitro; this activity will thus be referred to as autocleavage. Our research focuses on whether autocleavage occurs in the yeast and human proteins and under what conditions autocleavage occurs more efficiently. Additionally, we are exploring the stability of the protein using circular dichroism spectroscopy. We will present our findings on autocleavage and CD analysis.

Funding Source: Welch Foundation, ASBMB Undergraduate Research Award, NIH-NIGMS [R15GM120720]
Cloning of the *Escherichia coli* Methyl-accepting Chemotaxis Protein Tar and Characterization of Nickel Repellent Interactions

Aja Coleman*, Frank Healy

Sensory systems are vital to organismal survival and are used to interpret and detect the composition of the environment. *Escherichia coli* and other bacteria possess transmembrane chemoreceptor proteins that bind attractant and repellent chemoeffectors and these chemoreceptor-chemoeffector interactions direct bacterial swimming behavior. The *E. coli* chemoreceptor Tar binds the amino acid attractant aspartic acid as well as repellents such as nickel. In environments consisting of gradients of chemoeffectors, cells perform biased random walks to swim toward higher concentrations of attractants and away from higher concentrations of repellents. Physiological, genetic, biochemical and structural studies have elucidated the Tar-aspartate interaction, whereas our understanding of Tar-nickel interactions remains limited. To characterize the *E. coli* Tar-nickel interaction, a 2.2 kb DNA fragment encompassing the wild type *tar* gene and flanking regions was amplified from *E. coli* genomic DNA by PCR. Amplification products with added terminal HindIII sites were ligated to HindIII-digested low copy number plasmid vector pACYC177, and ligation products were used to transform high efficiency wild type competent *E. coli*. Plasmids were then used to transform an *E. coli* tar deletion mutant, and transformants were tested for restoration of Tar activity in a soft agar cell motility assay. Libraries of chemoeffector-binding periplasmic loop mutant *tar* alleles were generated by error-prone PCR. We are currently in the process of screening libraries to identify mutant pACYC177::*tar* derivatives that fail to complement tar deletion mutants for nickel repellent activity. Our ultimate goal is to identify Tar periplasmic loop residues required for nickel binding. Given the differences in the structures and properties of, e.g., aspartate and nickel, and their chemotactic responses, we would predict that nickel binding would occur in a unique region in Tar.

Funding source: Ronald E. McNair Scholars Program
Establishing the Role of the Rieske Reduction Potential in the Formation of Reactive Oxygen Species in Complex III

Mitch Beito*, Raheed Sunesra*, Victoria Henderson, Rudolfo Jarero, Laura Hunsicker-Wang, Ph.D.

The factors that modulate the reduction potential of the catalytic Rieske iron-sulfur protein (ISP) of Complex III in the electron transport chain have been studied extensively. During the bifurcated Q-cycle, the ISP transports one electron from quinol to cytochrome c1 via the ISP’s [2Fe-2S] cluster. Quinol’s other electron is passed from heme bL to heme bH, which reduces a quinone bound at the QN site. If either of these electrons are not effectively handed-off, they are then free to interact with molecular oxygen to produce superoxide, a form of reactive oxygen species (ROS). For example, if the ISP’s reduction potential is too low, it may never accept quinol’s electron or do so inefficiently. The latter scenario may shift Q-cycle equilibria against ISP movement towards cytochrome c1, instead favoring the ISP to release the electron, allowing the electron to interact with molecular oxygen to produce superoxide. Thus, we propose that a mismatch in reduction potential between the ISP and quinol may serve as a possible source of ROS generated from Complex III. At physiological levels ROS play an important role in intracellular communication, but at high concentrations, can damage proteins, amino acids, lipids, and DNA. Understanding the sources of ROS in the electron transport chain may lead to better treatments for diseases that arise from high levels of ROS.

We are investigating this hypothesis by (1) measuring the reduction potential of isolated truncated Saccharomyces cerevisiae (yeast) ISP grown in E. coli cells (ScRieske) in vitro via cyclic voltammetry and (2) measuring the amount of ROS produced by intact yeast Complex III (ScComplexIII) in vivo via a fluorometric assay. For ScRieske production, we are optimizing the expression and purification of the protein by Ni-NTA chromatography. For the intact Complex III project, ROS is being measured by fluorometry using MitoSOX Red as a fluorescent indicator. This ROS assay will be used to quantify ROS production of wild-type ScRieske and compare its production to mutants that have been shown to have altered reduction potentials. We are optimizing the quantification of ROS and incubation time with MitoSOX Red.

Funding Source: Murchison Summer Undergraduate Research Fellowship, Trinity Chemistry Department, Welch Foundation
Prp8: A Look at the Core of the Spliceosome

Virginia McGrath*, Addie Embry, Corina Maeder

The spliceosome is a multi-megadalton ribonucleoprotein complex that catalyzes the removal of noncoding introns and the ligation of coding exons. This process is crucial in the transformation of pre-mRNA into mRNA readable by the ribosome. At the core of this machinery lies a 280 kDa protein, Prp8, the largest component of the spliceosome. Its placement within the heart of the spliceosome results in interactions with a number of key splicing factors (5’SS, 3’SS, BPS, Brr2, Snu114). However, due to its size, the necessity of many of these interactions have yet to be elucidated. Here we are examining the importance of two Prp8 residues, 759 and 1591, through the combination of multiple techniques including yeast conjugation and sporulation, polymerase chain reaction-based site directed mutagenesis, bacterial and yeast transformations, splicing assays and growth assays. The effect of a combined double amino acid substitution at these two positions will also be assessed. We will present our findings regarding the importance of these two Prp8 residues, 759 and 1591.

Funding Source: NIH-NIGMS (RI5 GMI 20720) and the Welch Foundation
Dopamine Receptor Dependence of Cocaine-Mediated Changes in Connections onto Midbrain Dopamine Neurons

Aamuktha Karla*, Logan Muzyka*, Christina Guo, Adam Toler, Gerard M. J. Beaudoin, III

Dopamine plays an important role in communication between neurons, notably in the neural pathway that is involved in motivation and reward-seeking behavior. This pathway, called the mesolimbic dopaminergic pathway, is activated by stimulatory inputs, which are affected by a single exposure to cocaine. Our research is characterizing cocaine’s mechanism within one of these inputs by studying the synapses between the midbrain regions pedunculopontine tegmental nucleus (PPN) and substantia nigra pars compacta (SNc). Prior research has shown that cocaine induces changes in receptor composition at synapses between glutamatergic neurons in PPN and dopaminergic neurons in SNc. The ratio between two glutamate receptors, NMDA and AMPA, is used to assess this synaptic plasticity in response to in vivo cocaine exposure in mice. A virus encoding a fluorescent protein (YFP) and a light-operated cation channel (ChR2) is injected via stereotaxic surgery, allowing us to selectively excite PPN-innervated synapses on SNc dopamine neurons. Using electrophysiological recordings, 24 hours after in vivo cocaine exposure causes a decrease in the AMPA to NMDA receptor ratio. It is unknown, however, whether excitatory D1-like or inhibitory D2-like receptors are involved in this change. We are investigating the effect of a D1-like receptor antagonist (SCH 23390) and D2-like receptor antagonist (eticlopride) on the cocaine-induced decrease in the AMPA/NMDA ratio. Based on cocaine’s established role in inhibiting the dopamine transporter, we suspect that one or both of these receptors are required. Preliminary evidence suggests that D1 receptors are involved in cocaine-mediated plasticity of PPN-SNc synapses.

Funding Sources: Mindlin Foundation Undergraduate Mentored Research Grant, Murchison Summer Undergraduate Fellowship, Biology Summer Undergraduate Research Fellowship, Trinity Start-Up Funds
Signal amplification allows for sensitive and reliable detection of low concentrations of analyte. Polymerization amplification is a relatively new approach that takes advantage of the growth of a long polymer chain from one initiation event. The Cooley Lab is developing and evaluating a detection assay using a new signal amplification strategy that enables simple, real-time monitoring of a fluorogenic polymerization. This method couples the polymerization initiation event to the detection of the desired analyte, making the formation of a visible, fluorescent polymer signal a direct indicator of analyte presence. A controlled photoinitiated reversible addition fragmentation chain transfer (RAFT) polymerization was developed and optimized with an enzymatic degassing technique, which allows the radical polymerizations to be conducted in an open vessel. Additionally, an uncontrolled photoinitiated polymerization mechanism was employed to decrease the time required for signal detection. The results of these polymerization strategies to improve the efficiency and throughput of the detection assay will be presented.

Trinity University is grateful to the following organizations and donors for their support.

- 80/20 Foundation
- American Chemical Society Petroleum Research Fund
- Arnold & Mabel Beckman Foundation
- Biology Summer Undergraduate Research Fund
- Michael & Janice Doyle Chemistry Summer Fund
- Imogene and Harold Herndon Fund for Physical Science Research
- Howland, Eggen, and Pitts Computer Science Student Summer Research Fellowship
- Mr. E. Carey Joullian, IV and Mrs. Carol Joullian
- Tim and Karen Hixon Endowment for Environmental Studies
- The Steven P. Mach Family
- The Family of James Augustus McCloskey, Jr.
- The Andrew W. Mellon Foundation
- The Harold Murray Research Fund
- National Science Foundation
- National Institutes of Health
- Ronald E. McNair Scholars Program
- T. Frank and Norine R. Murchison Faculty Development Fund Research Corporation
- F.W. Olin - Entrepreneurship - E-Teams Endowment Fund
- Ed Roy Geosciences Fund
- San Antonio Area Foundation
- The Semmes Distinguished Scholars in Science Endowment Fund
- The Stumberg Family
- Texas Ecolab
- Tinker Family Endowment for Geosciences
- Trinity University East Asian Studies Program
- Welch Foundation