**Nicole Putnam, Ph.D., of Vanderbilt University**   
[**“The impact of innate immune recognition of Staphylococcus aureus on bone homeostasis and skeletal immunity”**](https://www.niaid.nih.gov/sites/default/files/nicoleputnamapplicationF31.pdf)

**Biographical Sketch:**

OMB No. 0925-0001 (Rev. 08/12 Approved Through 8/31/2015)

###### APPLICANT BIOGRAPHICAL SKETCH

NAME OF APPLICANT: **Nicole Putnam**

eRA COMMONS USER NAME:

POSITION TITLE: **Ph.D. candidate**

EDUCATION/TRAINING

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| INSTITUTION AND LOCATION | DEGREE | START DATE | END DATE  *(**or expected* *end date)* | FIELD OF STUDY |
| University of Wisconsin-La Crosse La Crosse, WI | B.S. | 08/2006 | 12/2010 | Biochemistry, Psychology |
| Johns Hopkins Bloomberg School of Public Health  Baltimore, MD | M.S. | 08/2012 | 06/2014 | Molecular Microbiology and Immunology |
| Vanderbilt University School of Medicine Nashville, TN | Ph.D. | 08/2014 | 05/2019 | Microbiology and Immunology |

###### Personal Statement

My research goals are focused on studying infectious diseases that have a drastic public health burden. I am seeking a Ph.D. in Microbiology and Immunology with the goal of establishing my own laboratory as an independent translational research scientist. Specifically, I hope to investigate critical immune responses and biological changes induced by pathogens, and contribute to how this knowledge can be leveraged to alleviate the morbidity and mortality associated with infection.

My undergraduate studies provided a strong foundation in biology and chemistry, and I was able to gain additional experience in translational research through an industry internship at Covidien, where I explored the development and application of cancer therapeutics. After identifying microbiology as an area of particular interest, I completed a Master of Science in Molecular Microbiology and Immunology at the Johns Hopkins Bloomberg School of Public Health. My Master’s degree thesis work involved the study of immune responses to measles virus in rhesus macaques in the laboratory of Dr. Diane Griffin, a world-renowned virologist. During this time, I developed expertise in immunologic techniques and experimental design, the critical review of primary literature, and scientific communication. These skills allowed me to be extremely productive in my four laboratory rotations as an incoming graduate student at Vanderbilt University. I chose to join Dr. Jim Cassat’s laboratory with a focus on osteoimmunologic responses to bacterial pathogens, because of my ongoing interests in the host responses to human pathogens.

Under Dr. Cassat’s guidance, I have become well-trained in microbiology and have developed a project that bridges multiple scientific disciplines with a long-term goal to determine the innate sensing capabilities of skeletal cells and how microbial pathogens impact bone remodeling. This project will guide my scientific training at the bench and professionally under the mentorship of Dr. Cassat and with the assistance of the exceptional resources available at Vanderbilt University, including the Vanderbilt Center for Bone Biology (VCBB), the Vanderbilt University Institute for Imaging Sciences (VUIIS), the Vanderbilt Program in Molecular Medicine (VPMM), and outstanding core facilities.

* 1. **Putnam NE**, Ford C, Wilde AD, Hendrix AS, Allaman M, Cassat JE. Mechanisms of inflammatory bone loss during *Staphylococcus aureus*-induced osteomyelitis. **Abstract: *Infection & Immunity*** ***Symposium***. 2016. Vanderbilt University, Nashville, TN.
  2. **Putnam NE**, Hendrix AS, Cassat JE. The role of innate immune recognition during *S. aureus*

osteomyelitis. **Abstract: *International Conference on Gram-Positive Pathogens***. 2016. Omaha, NE.

###### Positions and Honors

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| ACTIVITY/ OCCUPATION | START DATE | END DATE | FIELD | INSTITUTION/ COMPANY | SUPERVISOR/ EMPLOYER |
| Pharmaceutical Research and Development Intern | 06/10 | 08/10 | Organic chemistry, Biology | Covidien | Dr. Raghavan Rajagopalan |

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| ACTIVITY/ OCCUPATION | START DATE | END DATE | FIELD | INSTITUTION/ COMPANY | SUPERVISOR/ EMPLOYER |
| M.S. Thesis Research | 11/12 | 06/14 | Immunology, Infectious disease | Johns Hopkins Bloomberg School of Public Health | Dr. Diane Griffin |
| Nutrition Teacher | 05/13 | 05/14 | Public Health: City Health Initiative | Baltimore City Health Department, Baltimore Medical System | Pam Brown (Baltimore Medical System) |
| Pre-doctoral student | 08/14 | Present | Microbiology and Immunology | Vanderbilt University | Dr. Jim Cassat |

**Academic an****d Professional Honors**

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| 2016 | Travel Award, International Conference on Gram Positive Pathogens |
| 2015-2016 | Mini-Sabbatical Award from the Center for Microbial Pathogenesis, Vanderbilt University |
| 2015-2016 | Vanderbilt Institute for Clinical and Translational Research Voucher Award |
| 2013-2014 | MSCI Scholarship |
| 2010 | Best Poster Award, Intern Poster Symposium, Covidien |
| 2009-2010 | High Honor Award, Psi Chi International Honor Society, UW-La Crosse |
| 2009-2010 | Eta Phi Alpha Honors Fraternity, UW-La Crosse |

**Society Memberships**

2014-present Microbial Defense Academic Society, Vanderbilt University 2014-present American Association for the Advancement of Science 2012-2014 American Society for Microbiology

2012-2014 American Chemical Society

2009-2010 Golden Key International Honour Society, UW-La Crosse 2008-2010 Psi Chi International Honor Society, UW-La Crosse

###### Activities

2016-present Organizing committee for the Southeastern Immunology Symposium 2017 2016 Microbes 101 Guest Lecture, School of Science and Math at Vanderbilt

2016 Essentials of Staphylococcal Genetics Workshop, University of Nebraska Medical Center 2015-present Vanderbilt Program in Molecular Medicine, Vanderbilt University

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| 2015-2016 | Microbial Defense Academic Society Officer, Vanderbilt University |
| 2013-2014 | Service Outreach Resource Center (SOURCE) Service Scholar, Johns Hopkins University |
| 2009-2010 | Laboratory Manager, Visual Sciences Lab with Drs. O’Brien and Van Voorhis, UW-La Crosse |
| 2009 | Tutor, Physiological Psychology, UW-La Crosse |
| 2008-2009 | Research Assistant, Visual Sciences Lab with Drs. O’Brien and Van Voorhis, UW-La Crosse |
| 2008-2009 | Undergraduate Chemistry Research with Dr. Aaron Monte, UW-La Crosse |

###### Students Trained

2015-2016 Caleb Ford (MSTP), Lauren Williamson (IGP), Michael Yarboro(IGP) 2016-present Clare Laut(IGP)

###### Contributions to Science

1. **Investigation of bacterial hypoxic responses in the context of invasive infection**

As a Ph.D, student in Dr. Jim Cassat’s laboratory, my previous expertise in cell culture allowed me to conduct cytotoxicity analyses in human and murine primary cells and cell culture lines. For our *PLoS Pathogens* manuscript in 2015, I provided data showing that decreased oxygen levels during bacterial growth leads to the increased production of bacterial toxins, triggering a dose-dependent increase in cell death among eight cell types. This work was also highlighted in oral presentations at the 2015 *Gordon Research Conference on Staphylococcal Diseases* and the 2016 *Gordon Research Seminar on Microbial Toxins and Pathogenicity*. From these studies and a subsequent publication in *Antimicrobial Agents and Chemotherapy* from the Cassat lab in 2016, I provided assistance with osteomyelitis surgeries, animal monitoring and husbandry, and processing of femurs for CFU enumeration and microCT analysis. These skills obtained in my PhD laboratory have continued to be useful for the development of my research project, as outlined in the Research Strategy.

* 1. Wilde AD, Snyder DJ, **Putnam NE**, Valentino MD, Hammer ND, Lonergan ZR, Hinger SA, Aysanoa EA, Blanchard C, Dunman PM, Wasserman GA, Chen J, Shopsin B, Gilmore MS, Skaar EP, Cassat JE. Bacterial hypoxic responses revealed as critical determinants of the host-pathogen outcome by TnSeq analysis of *Staphylococcus aureus* invasive infection. 2015. ***PLoS Pathogens***. PMID: 26684646
  2. Wilde A, Valentino M, Hammer N, **Putnam N**, Lonergan Z, Hinger S, Perlmutter J, Aysanoa EA, Snyder D, Gilmore MS, Skaar EP, Cassat JE. Transposon sequencing analysis of a murine osteomyelitis model reveals hypoxic responses as key components of the Staphylococcal-host interaction. 2015. **Abstract: *Gordon Research Conference on Staphylococcal Diseases***. Lucca, Italy.
  3. Wilde AD, Snyder DJ, **Putnam NE**, Valentino MD, Hammer ND, Lonergan ZR, Hinger SA, Aysanoa EA, Blanchard C, Dunman PM, Wasserman GA, Chen J, Shopsin B, Gilmore MS, Skaar EP, Cassat JE. Bacterial hypoxic responses revealed as critical determinants of the host-pathogen outcome by TnSeq analysis of *Staphylococcus aureus* invasive infection. 2016. **Abstract: *Gordon Research Seminar on Microbial Toxins and Pathogenicity***, Waterville Valley, NH.
  4. Hendrix AS, Spoonmore TJ, Wilde AD, **Putnam NE**, Hammer ND, Snyder DJ, Guelcher SA, Skaar EP, Cassat JE. Repurposing the nonsteroidal anti-inflammatory drug diflunisal as an osteoprotective, anti- virulence therapy for *Staphylococcus aureus* osteomyelitis. 2016. ***Antimicrobial Agents and Chemotherapy***. PMID: 27324764

###### Elucidation of adaptive immune responses during measles virus infection

At the Johns Hopkins Bloomberg School of Public Health, I had the opportunity to work with an internationally recognized expert in virology, Dr. Diane Griffin. In my time in the Griffin lab, I completed a long- term measles infection study in rhesus macaques. In this study we had two major aims: (1) characterization of Th17 and Tc17 responses and (2) monitoring of viral RNA persistence. These aims were meant to explore mechanisms that may lead to the extended immunosuppression following measles virus infection.

To define the immune responses to measles virus in non-human primates, we processed and analyzed PBMCs, bone marrow-derived mononuclear cells, and lymph node specimens. Interestingly, we found that after an early lymphopenia, the adaptive immune response to measles virus is elevated in three distinct phases over the course of six months. We measured the measles virus-specific T cells, including CD4 helper T cells producing IFN-γ (Th1) and IL-17 (Th17), and their cytotoxic CD8 effector counterparts (Tc1, Tc17). Additionally, the discovery of persistent viral RNA over the course of infection implies that after clearance of infectious virus, persistent viral RNA is recognized leading to T cell activation.

I submitted a first-authored manuscript titled “Prolonged multiphasic Th17 and Tc17 responses during measles virus infection and RNA clearance” describing my thesis work to *The Journal of Infectious Diseases* in the fall of 2014. The manuscript is currently under revision to include Th1 and Tc1 data. Additionally, my data on the Th17 and Tc17 responses to measles virus infection was presented at the 2015 *Negative Strand Virus Meeting* held in Siena, Italy. Overall, these scientific pursuits have prepared me with the immunological expertise and assay knowledge to transfer these skills into a murine model of bacterial infection, and will allow me to expand on any distinctive immunological findings during this research proposal.

1. Griffin DE, **Putnam NE**, Nelson A, Hauer D, Baxter V, Adams RJ. Prolonged multiphasic Th17 and Tc17 responses during measles virus infection and RNA clearance. 2015. **Abstract: *16th Annual*** ***Negative Strand Virus meeting***. Siena, Italy.

*2.*

###### Analysis of regulatory T cells and immune tolerance in autoimmunity

As a rotation student in Dr. Dan Moore’s lab, I was able to optimize an assay that was a major hurdle for his team. Specifically, I worked on developing an *ex vivo* assay for functionally active T regulatory cells. I successfully optimized this assay and obtained consistent results showing suppression of T cell proliferation by T regulatory cells.

I also worked closely with a graduate student in the Moore lab to examine the role of immune tolerance induction in systemic lupus erythematosus (SLE) mice and the role of CD8 T regulatory cells in Type 1 Diabetes in non-obese diabetic (NOD) mice. I assisted with *in vivo* and *ex vivo* experiments, and acquired and analyzed data using flow cytometry. From this project, I am listed as middle author on a 2015 paper in the *American Journal of Transplantation*. The Moore lab provided skillful instruction to begin working with murine models, exposure into designing creative experiments using cell transfer between genetically modified mice, and allowed me to develop familiarity with handling mice and harvesting immune cells.



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1. Stocks BT, Wilhelm AJ, Wilson CS, Marshall AF, Putn am NE, Major AS, Moore DJ. Lupus-prone mice resist immune regulation and transplant tolerance induction. 2015. ***American Journal of Transplantation.*** PMID: 26372909 .

1. **Pharmaceutical research and development internship: Development of cancer therapeutics**

My internship focused on applying the principles of phototherapy to develop cancer therapeutics that target and destroy ovarian and colon cancer cells. Photosensitive compounds are activated by a characteristic wavelength, causing oxygen radicals to form and induce cancer cell death. My project was divided into three parts: (1) synthesis of new photosensitizer bearing a diaza (N-N) bond through organic synthesis and evaluation of free radical formation using electron spin resonance (ESR), (2) conjugation of photosensitizers to bioactive carriers, and (3) *in vitro* cell binding and cell viability assays with the photosensitizers and conjugates.

I successfully generated a new photosensitive compound and confirmed the capacity for radical formation by this and other compounds generated in the laboratory. I accomplished delivery of photosensitizers to cancer cells through conjugation to specific cancer-targeting molecules, followed by selective targeting and internalization confirmation. Finally, I conducted cytotoxicity assays to demonstrate efficacy of photosensitizers *in vitro.* I went on to present my work at the Covidien 2010 Intern Poster Symposium and won the Best Poster Award.

My work on folate receptor targeting and internalization in ovarian cancer was shared in 2011 at the SPiE BiOS: Biomedical Optics symposium. Additionally, my evaluation of compounds for radical formation using ESR was published in *Photodiagnosis and Photodynamic Therapy* and presented at the 13th World Congress of the International Photodynamic Association. My research experiences at Covidien allowed me to directly follow chemical synthesis of each compound with the evaluation of biological effects, which instilled the importance of multidisciplinary research early in my scientific career.

1. **Putnam, N,** Rajagopalan, R, Karwa, A, Nickols, M, and L Chinen. (2010). Targeted photosensitizer bioconjugates for cancer phototherapy. Covidien Intern Poster Symposium, Covidien, St. Louis, MO.
2. Rajagopalan R, Poreddy AR, Karwa A, Asmelash B, Putnam NE, Chinen L, Nickols M, Shieh JJ, Dorshow RB. Folate receptor targeted Type 1 photosensitizer bioconjugatesfor tumor visualization and phototherapy. 2011. Abstract: *Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy XX,* within the SPIE BiOS: Biomedical Optics Symposium. San Francisco, CA.
3. Rajagopalan R, Lin T, Karwa A, Poreddy A, Asmelash B, Putnam N, Lin D, Dorshow R. Discoveryand development of novel thiaza and thioxa Type 1 photosensitizers. 2011. ***Photodiagnosisand photodynamic therapy.***
4. Rajagopalan, R, Lin, T, Karwa, A, Poreddy, A, Asmelash, B, **Putnam, N,** Lin, D, R Dorshow. Discovery and development of novel thiaza and thioxa type 1 photosensitizers. 2011. **Abstract: *13th World Congress of the Int***



***ernational Photodynamic Association .*** Innsbruck, Austria.

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**Nico Contreras, University of Arizona**

[**“The Immunological Consequences of Mouse Cytomegalovirus on Adipose Tissue”**](https://www.niaid.nih.gov/sites/default/files/F31-sample-application_nico_contreras.pdf)

**Biographical Sketch:**

#### BIOGRAPHICAL SKETCH DO NOT EXCEED FIVE PAGES.

NAME: Contreras, Nico Anthony

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Graduate Research Assistant

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

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| INSTITUTION AND LOCATION | DEGREE  *(if applicable)* | Completion Date MM/YYYY | FIELD OF STUDY |
| University of Arizona, Tucson, AZ | B.S. | 05/2012 | Physiological Sciences |
| University of Arizona, Tucson, AZ | M.S. | 05/2014 | Professional Sciences in Applied Biosciences |
| University of Arizona, Tucson, AZ | Ph.D. | projected 05/2019 | Immunobiology |

#### Personal Statement

During my time in graduate school, and most specifically in the Nikolich-Zugich laboratory I have developed my technical skills as a researcher in the use of multi-parameter flow cytometry, as well as other molecular and cellular biology tools. Furthermore, I have developed and improved upon my critical thinking and experimental design. The proposal described herein, we conceived independently during my time in the laboratory and I believe it adds a new layer to the work that is currently being performed within the Nikolich- Zugich lab.

Prior to joining Dr. Janko Nikolich-Zugich’s laboratory for my Ph.D. thesis work I completed a Professional Science Master’s degree with Dr. Linda Powers. This project was focused on developing a lateral flow assay to be used in remote and rural locations to determine if blood samples were contaminated with bloodborne pathogens, sponsored by the Office of Naval Research and the Department of Defense. This project was extremely collaborative and I was responsible for weekly progress briefings, as well as monthly written reports for an extremely interdisciplinary team. I learned a wide array of new techniques and was a successful member of the team. As a member in the Nikolich-Zugich laboratory I have been exposed to cutting edge immunologic methodologies and have demonstrated that I am capable of quickly learning necessary techniques in order to drive experimental progress.

I have demonstrated improved understanding and work within my field over time. As the first member of my family to complete a Bachelor’s degree and obtain a position in graduate school, as well as being a member of several diversity development groups I believe that I would make a strong candidate to receive funding through an NIH/NIA research diversity supplement. Additionally, I have received NIH funding through the Initiative to Maximize Student Diversity Award and currently sit on the Department of Immunobiology Diversity Committees and these activities are firmly within the spirit of this program. I believe I clearly show an ability to learn necessary laboratory techniques to drive projects forward, as well as be responsible for communicating and defending the results.

#### Positions and Honors

List in chronological order previous positions, concluding with the present position. List any honors. Include present membership on any Federal Government public advisory committee.

Wildcat Excellence Award 2008-2012 (Tuition Scholarship)

Arizona Instrument to Measure Standards Award 2008-2012 (Tuition Scholarship) *Declined*

Dean’s List Honorable Mention 2008 Roman DeSanctis Scholarship 2010-2011

Capital One All-American Mascot Challenge Award 2011-2012 University of Arizona Graduate College Dean’s Tuition Award 2014

American Association for the Advancement of Science Member 2014-Current American Aging Association Member 2014-Current

Initiative for Maximizing Student Development Grantee 2014-2015 ThymUS Maui NIH Under Represented Minority Travel Award 2016

#### Contributions to Science Oral Presentations

Contreras, N.A. (2015) Your Immune System and Your Food. Immunobiology Seminar. The University of Arizona. Tucson, AZ.

Contreras, N.A. (2016) Fattening Up Your Immune System. Immunobiology and Cellular Molecular Medicine Joint Seminar. The University of Arizona. Tucson, AZ.

#### Poster Presentations

Contreras, N.A., Fontana, L., and Nikolich-Zugich J. (2016) Reversible Lymphopenia Induced By Calorie Restriction. Frontiers in Immunobiology Symposium. The University of Arizona. Tucson, AZ.

#### PhD Rotations

To date I have been part of a study involving the characterization of the immune response following stroke, within Kristian Doyle’s PhD lab, in the context of both acute and chronic strokes. Specifically my aims were to determine cytokine and chemokine profiles in the brain with first incidence of stroke as well as recurrent strokes by using two mouse models to account for heterogeneity. Additionally, I was able to use fresh frozen tissue from human subjects and analyze their cytokine and chemokine profiles across an aged cohort. Finally, I quantified T- and B-cell counts in the stroke lesion as well as within the brain to demonstrate the leakiness of the glial scar that forms following stroke. These studies will lead to the development of novel therapeutics for better outcomes following stroke.

During a second rotation study I was a member of the Anity Koshy, MD lab where I worked to develop a genetic knockout of *Toxoplasma gondii* using the CRISPR/Cas9 system. Using this novel genetic tool I attempted to knockout a sugar transporter in this parasite in order to prevent the formation of cysts in the central nervous system to determine what pathways this cyst interrupts, in hopes that these pathways can be used for a better understanding of neuroinflammation in the brain that is present in several diseases such as Alzheimer’s and MS.

My final obligatory research rotation was performed in the Nikolich-Zugich laboratory, where I continue to conduct research. My project focus was on peptide stimulation of banked human peripheral blood mononuclear cells (PBMCs) with epitopes of the human cytomegalovirus. After stimulation I was to assay cytokine production by CD8 T cells. In parallel I was tasked with determining the neutralizing antibody titers of the same people using banked serum. The intent of this project was to determine if there was a correlation with amount of cytokine produced by T cells and neutralizing antibody from serum across the lifespan of patients infected with cytomegalovirus.

#### Outreach

The University of Arizona Joint Biology Retreat Committee Member 2015

The University of Arizona Department of Immunobiology Diversity Committee Member 2015 - Current BASIS School Oro Valley Science Outreach Volunteer:

I volunteered at a charter school to teach children basic scientific concepts including surface tension, acid/base differences, and viscosity and density.

#### Masters Thesis

As a member of an interdisciplinary team I helped develop a rapid lateral flow assay for the detection of blood borne pathogens. Specifically I was involved in the development of an affinity peptide assay for use to detect Hepatitis C virus, Human Immunodeficiency Virus, and Plasmodium *sp.* The team was successfully able to

develop a test that is currently undergoing military specification qualifications for use in the field and has led to a publication in press. These studies will lead to a military grade point-of-care device to be used for rural medicine needs as well as blood screenings for use in military operations.

#### Scholastic Performance

Graduate Record Exam Scores:

The University of Arizona grades on a Regular Grading Scale: A, B, C, D, E. With D being a passing grade. Transfer Credits are denoted with a T prior to the Regular Grade. S = Superior and is not calculated in the GPA. K = course in progress that spans multiple semesters. P = pass in a Pass/Fail course and is not calculated in the GPA.

**Course Description Term Grade Course Description Term Grade**

**Samantha Lynne Schwartz, Emory University**

[**“Regulation of 2'-5'-Oligoadenylate Synthetase 1 (OAS1) by dsRNA”**](http://www.niaid.nih.gov/sites/default/files/F31-Sample-Application_Samantha-Schwartz.pdf)

**Biographical Sketch:**

### BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.

Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Schwartz, Samantha Lynne eRA COMMONS USER NAME:

POSITION TITLE: Graduate Student EDUCATION/TRAINING

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| --- | --- | --- | --- | --- |
| INSTITUTION AND LOCATION | DEGREE  *(if applicable)* | Start Date MM/YYYY | Completion Date MM/YYYY | FIELD OF STUDY |
| Armstrong State University, Savannah, GA  Emory University, Atlanta, GA | B.S.  Ph.D. | 08/2007  08/2015 | 05/2012  In progress | Biology  Biochemistry, Structural Biology |

# Personal Statement

The goal of this proposal is to obtain extramural funding to support my Ph.D. thesis research. This independent funding will enhance my technical and professional training experience through my project investigating the molecular mechanisms of RNA-mediated regulation of innate immune system proteins. I hope that securing this fellowship award will be an important step on the path to a career as an independent researcher.

Being a first-generation college student was not without its challenges. At the beginning of my sophomore year I received my first and only ‘F’ grade in organic chemistry. This result initially shook my confidence but also made me realize that I had a lot of growing to do. Recognizing that this might not be my last setback, I used this renewed motivation to work harder and to not be intimidated by obstacles. Determined to show (mainly to myself) that I could overcome such obstacles, I later repeated organic chemistry and earned the ‘A’ I knew I was always capable of achieving. Although my confidence in my own ability and potential has grown considerably since those early days in college, the determination to overcome such setbacks and to continue to learn and improve as I work towards my career goals has stuck with me. My persistent-nature has been an asset and I think a valuable quality to have in the field of scientificresearch.

Later in my undergraduate career, I pursued a research opportunity with one of my professors, Dr. Jennifer Brofft, investigating microbes that cause sea turtle eggs’ failed development. After undergrad, I knew I wanted to pursue graduate school, but I wanted to make a more informed decision prior to making a commitment. To gain this additional experience, I became a research technician at Emory University where I worked on the double-stranded RNA (dsRNA)-activated protein kinase (PKR). My thesis project will not only allow me to gain new technical skills (as well as perfect existing ones), but to also use this opportunity to develop as an independent scientist. I plan to seek opportunities that will aid in my professional development, such as attending conferences, giving poster presentations and talks, as well as writing primary literature to improve the way I communicate science. It is important to me to have both the technical and professional skills necessary to be successful as I will require these skill sets to secure a position as a postdoctoral fellow and ultimately lead an independent research team.

# Positions and Honors

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| ACTIVITY/ OCCUPATION | START DATE  (mm/yy) | END DATE  (mm/yy) | FIELD | INSTITUTION/ COMPANY | SUPERVISOR/ EMPLOYER |
| Undergraduate Researcher | 01/2011 | 05/2012 | Microbiology | Armstrong State University | Jennifer Brofft, Ph.D. |

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| Tutor, Writing Center | 08/2011 | 05/2012 | Communication, Writing | Armstrong State University | Deborah Reese, Ph.D. |
| Research Specialist | 06/2012 | 08/2015 | Biochemistry | Emory University | Graeme Conn, Ph.D. |

### Academic and Professional Honors

2007-2012 **HOPE Scholarship,** *Armstrong State University:* Merit-based award available to Georgia residents who have demonstrated academic achievement. Must graduate from high school with a minimum 3.0 grade point average and maintain a minimum 3.0 cumulative post-secondary grade point average to remain eligible.

2009-2012 **Dean’s List,** *Armstrong State University:* Must be enrolled full-time and earn a grade point average of at least 3.6 per semester.

2010-2012 **Tri-Beta National Biological Honor Society,** *Armstrong State University:* Must maintain a grade point average of at least 3.0 in all biology major courses.

2011-2012 **National Science Foundation STEM Talent Expansion Program,** *Armstrong State University:* Bridging the Gap: Using Research and Learning Communities to Increase STEM Majors (0856593).

2011-2012 **Biology Faculty Recognition Award,** *Armstrong State University:* Faculty nominate and award a student who demonstrates outstanding leadership abilities, excels in undergraduate research, and achieves other notable academic distinctions.

2012 **Phi Kappa Phi Honor Society,** *Armstrong State University:* By invitation only. Must be a senior in the top 10 percent of their class.

2012 ***Magna Cum Laude*,** *Armstrong State University:* Must graduate with a grade point average of 3.50-3.79.

2016-present **National Institutes of Health Training Grant (T32),** *Emory University:* Training Program in Biochemistry, Cell, and Developmental Biology (5T32GM008367-27).

# Contributions to Science

* 1. **Regulation of 2’-5’-oligoadenylate synthetase 1 (OAS1) by double-stranded RNA.**

My thesis project in Dr. Graeme Conn’s lab involves elucidating the mechanisms underlying OAS1 regulation by RNA. This work will provide novel insights into cellular translational control as well as the foundations necessary to design effective treatments for viral infection. I am currently working to develop bio-layer interferometry and cell-based assays as outlined in this proposal. My preliminary data will also be presented at the 14th Annual DSAC Student Research Symposium (ref. **a**) sponsored by the Laney Graduate School of Emory University.

a) **Schwartz, S.L.**, Conn, G.L. Differential regulation of 2’-5’-oligoadenylate synthetase 1 (OAS1) by small double-stranded RNAs. 14th Annual DSAC Student Research Symposium. Atlanta, GA. 19 January 2017. [Poster]

* 1. **Droplet digital PCR: A novel method for detection of influenza virus defective interfering particles.** During my ten-week rotation in Dr. Anice Lowen’s lab, I developed a method based on reverse transcription droplet digital PCR. To apply droplet digital PCR technology for the measurement of defective interfering (DI) genomes, I designed primers targeting: **i)** nucleotides 50–150 of each gene segment, a region typically present in both DI and standard segments, and **ii)** an internal site lacking in all DI segments described to date. The ratio of internal to terminal copies/μl for a given segment was used to indicate what proportion of the total copies was full-length. All segments were analyzed for three stocks of influenza A/Panama/2007/99 (H3N2)

virus of differing passage histories. Evidence of DI particles was seen in each stock, but their abundance differed substantially and as expected based on passage history. I performed and analyzed the results of all experiments, designed figures, and wrote the manuscript (ref. **a** and **b**) with insight from Dr. Lowen.

1. **Schwartz, S.L.**, Lowen, A.C. (2016). Droplet digital PCR: A novel method for detection of influenza virus defective interfering particles. *J. Virol. Meth*. **237**, 159-165 (PMCID: PMC5056858).
2. **Schwartz, S.L.**, Lowen, A.C. Droplet digital PCR assay for quantification of defective interfering influenza A viruses. 9th Annual NIAID Centers of Excellence for Influenza Research and Surveillance Network Meeting. Memphis, TN. 26-29 June 2016. [Poster]

### Developed and applied a high throughput assay to measure PKRactivity.

During my time as a research specialist in Dr. Graeme Conn’s lab, I developed a high-throughput radiometric assay used to measure PKR activity. The activity assays allowed the discovery of novel findings: the interdomain linker appeared to be unexpectedly unnecessary for regulation of PKR (activation or inhibition), domain swapping showed that both the double-stranded RNA-binding domain (dsRBD) and kinase domain are important for inhibition, and the general scheme of inhibition seemed to be the same for different inhibitory RNAs. The PKR activity assay became the key feature of two of my publications (ref. **a** and **b**) and has become the standard assay still used by others in the lab today. I was also invited to my undergraduate institute, Armstrong State University, to give a lecture (ref. **c**) on these published works (ref. **a** and **b**) with the goal of sharing my experiences and inspiring undergraduates with the knowledge I have garnered through my time both as a research specialist working at the bench full-time and as a current graduate student.

1. Wilson J.L.\*, Vachon V.K.\*, Sunita S., **Schwartz S.L.**, Conn, G.L. (2014). Dissection of the adenoviral VA RNAI central domain structure reveals minimal requirements for RNA-mediated inhibition of PKR. *J. Biol. Chem*. **289**(33), 23233-23245 (PCMID: [PMC4132820](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4132820/)). [*\*Co-first author*]
2. Sunita, S.\*, **Schwartz, S.L.\***, and Conn, G.L. (2015). The regulatory and kinase domains but not the interdomain linker determine human double-stranded RNA-activated kinase (PKR) sensitivity to inhibition by viral non-coding RNAs. *J. Biol. Chem*. **290**(47), 28156-28165 (PCMID: [PMC4653674](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4653674/)). [*\*Co-firstauthor*]
3. **Schwartz, S.L.** (2016). Human double-stranded RNA-activated kinase (PKR) inhibition by viral RNA requires both structured domains. Armstrong State University, Savannah. 3 November 2016. Lecture.

<*https://*[*www.armstrong.edu/academic-departments/biology-spring-seminar-series>.*](http://www.armstrong.edu/academic-departments/biology-spring-seminar-series)

### PUBLICATIONS

<https://www.ncbi.nlm.nih.gov/sites/myncbi/1XQwdr7tzrPQ1/bibliography/51319590/public>

# Scholastic Performance

### ARMSTRONG STATE UNIVERSITY (UNDERGRADUATE) GPA: 3.60

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| YEAR | SCIENCE COURSE | TITLE | GRADE | YEAR | OTHER COURSE TITLE | GRADE |

**[Personal Details removed for privacy]**

**EMORY UNIVERSITY (GRADUATE) GPA: 3.90**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| YEAR | SCIENCE COURSE TITLE | GRADE | YEAR | OTHER COURSE TITLE | GRADE |
| 2015 | Foundations in BCDB I | A | 2015 | Jones Program in Ethics | S |
| 2015 | Introductory Graduate Seminar | A- | 2016 | Jones Program in Ethics: Workshop | S |
| 2015 | Laboratory Rotations | A | 2016 | Graduate School Teaching Assistant Workshop | S |
| 2016 | Foundations in BCDB II | A- |  |  |  |
| 2016 | Introductory Graduate Seminar | A |  |  |  |
| 2016 | Laboratory Rotations | A |  |  |  |
| 2016 | Advanced Graduate Research | A |  |  |  |
| 2016 | Hypothesis Design and Scientific | A |  |  |  |
|  | Writing |  |  |  |  |
| 2016 | Advanced Graduate Seminar | S |  |  |  |
| 2016 | Advanced Graduate Research | A |  |  |  |

For letter grades: A = 90-100%, A- = 90-92%, B = 80-89%, C = 70-79% (grades with +/- distinction only apply to Emory University). Attendance and/or participation were used to grade Satisfactory (S) or Unsatisfactory (U) courses.