

Science Undergraduate Laboratory Internships (SULI)

Summer 2022 - Application for: Paul Anderson

APPLICANT PROFILE

General Applicant Information

First Name: Paul

Middle Name:

Last Name: Anderson

Previous Last Name(s):

Primary Email Address: pcanderson01@email.wm.edu

Alternate Email Address 1: starcalc0228@gmail.com

Alternate Email Address 2:

ORCID: [0000-0002-4610-1275](https://orcid.org/0000-0002-4610-1275)

Current Address

Primary Phone Number: 757-510-0394

Alternate Phone Number:

Citizenship/Languages/Eligibility Information

I will be 18 years of age or older by the time the internship begins: Yes

Are you a U.S. Citizen? Yes

Science Undergraduate Laboratory Internships (SULI)

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EDUCATIONAL BACKGROUND

Academic Information

Are you currently attending a community college or 2-year college? No

Current academic status: Junior

If you are selected as a participant in this DOE program, will you receive academic credit from your university/college for participating? No

Undergraduate Institution Information

College/University Country: United States and U.S. Territories

College/University State/Province/Territory: Virginia

College/University Name: College of William and Mary

College/University Address: Sadler Center, 200 Stadium Dr

College/University City: Williamsburg

College/University Zip Code: 23187-8795

Expected/Declared Major:

- Mathematics
- Physical Sciences - Physics

Expected Degree From This College/University: Bachelor's

Expected/Completed Graduation Date: May / 2023

Transcript: Academic Transcript.pdf

Does this institution provide grades? Yes

GPA Scale: 4.0

Total Attempted Credits: 3.96

Total Earned Credits: 57.00

Total Quality Points: 226.20

GPA: 3.97

Science Undergraduate Laboratory Internships (SULI)

Summer 2022 - Application for: Paul Anderson

Science, Technology, Engineering and Mathematics (STEM) Courses

Course Title: Abstract Algebra

Course Number: MATH 307

Enrollment Status: Recently Completed

Course Title: Advanced Linear Algebra

Course Number: MATH 408

Enrollment Status: Currently Enrolled

Course Title: Classical Mechanics of Particles and Waves 1

Course Number: PHYS 208

Enrollment Status: Recently Completed

Course Title: Classical Mechanics of Particles and Waves 2

Course Number: PHYS 303

Enrollment Status: Currently Enrolled

Course Title: Complex Analysis

Course Number: MATH 405

Enrollment Status: Currently Enrolled

Course Title: Electricity & Magnetism

Course Number: PHYS 401

Enrollment Status: Planning to Enroll

Course Title: Electronics

Course Number: PHYS 255

Enrollment Status: Recently Completed

Course Title: Elements of Lie Theory

Course Number: MATH 410-02

Enrollment Status: Planning to Enroll

Course Title: Fluid Mechanics

Course Number: PHYS 302

Enrollment Status: Planning to Enroll

Course Title: Partial Differential Equations

Course Number: MATH 442

Science Undergraduate Laboratory Internships (SULI)

Summer 2022 - Application for: Paul Anderson

Enrollment Status:	Recently Completed
Course Title:	Quantum Mechanics 1
Course Number:	PHYS 313
Enrollment Status:	Currently Enrolled
Course Title:	Quantum Mechanics 2
Course Number:	PHYS 314
Enrollment Status:	Planning to Enroll
Course Title:	Topology
Course Number:	MATH 426
Enrollment Status:	Currently Enrolled
Awards or Honors	
Award Title:	Monroe Scholar
Month & Year Received:	August / 2019
Awarding Institution:	William & Mary
Award Title:	Eagle Scout
Month & Year Received:	May / 2018
Awarding Institution:	Boy Scouts of America
Award Title:	Dean's List
Month & Year Received:	December / 2019
Awarding Institution:	William & Mary
Award Title:	Dean's List
Month & Year Received:	May / 2020
Awarding Institution:	William & Mary
Award Title:	Dean's List
Month & Year Received:	December / 2020
Awarding Institution:	William & Mary
Award Title:	Dean's List
Month & Year Received:	May / 2021
Awarding Institution:	William & Mary

Science Undergraduate Laboratory Internships (SULI)

Summer 2022 - Application for: Paul Anderson

High School Graduation or GED

Date of High School Graduation or GED:	May / 2019
Country:	United States
City:	Smithfield
State/Province/Territory:	VA

Science Undergraduate Laboratory Internships (SULI)

Summer 2022 - Application for: Paul Anderson

WORK EXPERIENCE & SKILLS

Professional Associations

Are you a member of any
professional organizations?

No

Computer Skills

Computer related skills:

- Standard Software Applications
- Proficient in Word, Excel and Powerpoint

- Programming Languages
- Skilled in Mathematica
- Proficient in C++, LaTeX, and Python
- Experience in basic MatLab

Science Undergraduate Laboratory Internships (SULI)

Summer 2022 - Application for: Paul Anderson

PROGRAM INFORMATION

Eligibility

Have you previously participated in 2
SULI appointments? No

Previous DOE Internship/Fellowship or Lab Activity Experience

Have you ever had an
internship/fellowship with the
Department of Energy or any of its
National Laboratories (such as SULI,
CCI, VFP) or attended an activity at
one of the National Laboratories
(such as a Mini-Semester or
Sustainable Research Pathways)? No

Availability

What is the earliest date you can
begin your internship? 6/1/2022

When do you need to complete your
internship? 8/31/2022

First Choice Host DOE Laboratory

DOE Laboratory: Thomas Jefferson National Accelerator Facility (TJNAF)

First Choice Research Area: Nuclear Physics

Second Choice Research Area: High Energy Physics

Third Choice Research Area: Nuclear Science

Second Choice Host DOE Laboratory

DOE Laboratory: Brookhaven National Laboratory (BNL)

First Choice Research Area: Condensed Matter Physics

Second Choice Research Area: Nuclear Physics

Third Choice Research Area: Astronomy/Astrophysics

Relatives Employed at DOE Laboratories

Are you a relative of an employee at
the proposed host DOE laboratories? No

Science Undergraduate Laboratory Internships (SULI)

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ESSAYS

Research Experience:	<p>I have participated in 3 research projects prior to this.</p> <p>The first was investigating stochastic mechanics as a model for quantum mechanics, with a special focus on modeling the hydrogen atom. We used Mathematica to try and model the theoretical stochastic processes occurring with the electron as it orbited the hydrogen atom to see if we could recreate its known properties. This project ran for one academic year with weekly meetings for guidance from my advisor as well as occasional collaboration between two other students doing similar work.</p> <p>My second project was focused on stochastic hydrodynamics and investigating the potential for Thermal Casimir forces between plates placed close together. It involved trying to analyze the partial differential equations used to model hydrodynamic forces, and solve certain boundary value problems. This project ran over the summer of 2021 and consisted of weekly meetings with my advisor for guidance.</p> <p>My final project, which is ongoing, is investigating the nature of quantum mechanical systems via methods of Lattice Quantum Chromodynamics theory. The bulk of the work involves programming python code to calculate path integrals for the time evolution operator of different systems. This project involves weekly meetings for guidance from my advisor.</p>
Research Interests:	<p>I am primarily interested in theoretical physics. Beyond that, my preference is towards fields which require a higher amount of mathematical analysis as opposed to coding. Furthermore, I lean heavily towards fundamental physics rather than applied, though I also have an interest in condensed matter physics. From here, I have no particular preference. I should note this is not due to a lack of a particular interest, but simply because I enjoy getting to experience any field I have not encountered.</p> <p>As for choice of host facilities, Jefferson Lab was chosen primarily because it is a rather close facility to my home, making it convenient to get to. From here, the second choice could have gone in multiple directions. Although I picked Brookhaven, I really do not have a strong preference, as I also considered Fermi Lab, Berkeley, and most of the others. The ones I might have less of a preference for were those focused on renewable energy, since I am primarily interested in fundamental physics.</p>
Personal Experience:	<p>Perhaps my two strongest traits are my curiosity and discipline. The former has led to me exploring topics as diverse as measure theory and multilinear algebra without any need to do so, while my discipline has allowed me to teach myself significant parts of some courses in anticipation of a difficult semester.</p> <p>Furthermore, both traits have driven me to compensate for classes that didn't teach me nearly as much as I would have hoped. For instance, my Partial Differential Equations class didn't cover as much content as I would have hoped, so I simply explored the textbook on my own.</p> <p>I also act as a team player, which has a strong synergy with my communication skills. I frequently participate in study groups, where I consistently aid in explaining homework questions.</p> <p>My curiosity also meshes with my ambition and dedication when choosing courses. Despite having enough credits to take a light load of courses, I consistently take a full load and beyond in an attempt to learn as much as possible. This even extends to the point where I am taking a graduate school level course, even though it does not count for credit.</p> <p>Finally, I am incredibly organized. This is most prominent in my file management, which has allowed me to keep careful track of all my various assignments and paperwork since starting college.</p>
Professional Goals:	<p>My most immediate plans after earning my Bachelor's Degree is to attend graduate school and earn a Ph.D. in physics. My current idea for an area of research is condensed matter physics, but I am largely drawn towards any field which heavily involves mathematical analysis. From there, I hope to work in industry or for the government, continuing to research topics in physics.</p> <p>Beyond more research experience in yet other fields of physics that I have yet to explore, the SULI program would also allow me to work with a national facility, a new experience which would give me a better picture of my long term goals. It would also help me in refining my research methods.</p>

Science Undergraduate Laboratory Internships (SULI)

Summer 2022 - Application for: Paul Anderson

RECOMMENDATIONS

Recommendation 1: **First Name:** Christopher
Last Name: Monahan
Email: cjmonahan@wm.edu
Status: Received 11/22/2021

Recommendation 2: **First Name:** Joshua
Last Name: Erlich
Email: jxerli@wm.edu
Status: Received 1/2/2022

This is a Web self-service transcript for student use. Courses which are in progress may also be included on this transcript.

[Transfer Credit](#) [Institution Credit](#) [Transcript Totals](#) [Courses in Progress](#)

Transcript Data

STUDENT INFORMATION						
Name :		Paul C. Anderson				
Curriculum Information						
Current Program						
Bachelor of Science						
College:	Faculty of Arts and Sciences					
Major and Department:	Physics, Physics					
Major and Department:	Mathematics, Mathematics					
Major Concentration:	Standard Mathematics					
***Transcript type:WEB is NOT Official ***						
DEGREES AWARDED						
Sought:	Bachelor of Science	Degree Date:				
Curriculum Information						
Primary Degree						
College:	Faculty of Arts and Sciences					
Major:	Physics					
Major:	Mathematics					
Major Concentration:	Standard Mathematics					
	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA
Institution:	57,000	57,000	57,000	57,000	226.20	3.96

DEGREES AWARDED							
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Sought:	Bachelor of Science	Degree Date:					
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Curriculum Information							
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Primary Degree							
College:	Faculty of Arts and Sciences						
Major:	Physics						
Major:	Mathematics						
Major Concentration:	Standard Mathematics						
	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA	

Institution:	57.000	57.000	57.000	57.000	226.20	3.96	
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TRANSFER CREDIT ACCEPTED BY INSTITUTION							
-Top-							

2017-2019:	Thomas Nelson Cmnty College						
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Subject	Course	Title	Grade	Credit Hours	Quality Points	R	
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ARTH	251	Pre-Modern European Art	T	3.000	0.00		
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CHEM	206	Organic Chemistry I	T	3.000	0.00		
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CHEM	206L	Organic Chemistry Lab I	T	2.000	0.00		
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CHEM	207	Organic Chem II for Life Sci	T	3.000	0.00		
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	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA	
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Current Term:	0.000	0.000	11.000	0.000	0.00	0.00	
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Unofficial Transcript							
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2017-2019:	Paul D Camp Cmty College						
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Subject	Course	Title	Grade	Credit Hours	Quality Points	R	
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CSCI	141	Computational Problem Solving	T	4.000	0.00		
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ECON	101	Principles: Microeconomics	T	3.000	0.00		
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ENGL	210	College Composition II	T	3.000	0.00		
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SPCH	201	Public Speaking	T	3.000	0.00		
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WRIT	101	Writing	T	3.000	0.00		
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	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA	
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Current Term:	0.000	0.000	16.000	0.000	0.00	0.00	
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Unofficial Transcript							
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Fall 2018:	Tidewater Cmty Coll Norfolk						
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Subject	Course	Title	Grade	Credit Hours	Quality Points	R	
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MATH	212	Intro Multivariable Calculus	T	4.000	0.00		
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	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA	
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Current Term:	0.000	0.000	4.000	0.000	0.00	0.00	
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Unofficial Transcript							
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Fall 2019:	Advanced Placement Credit						
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Subject	Course	Title	Grade	Credit Hours	Quality Points	R	
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CHEM	103	General Chemistry I	T	3.000	0.00		
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CHEM	103L	General Chemistry Lab I	T	1.000	0.00		
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CHEM	254	General Chemistry Lab II	T	1.000	0.00		
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CHEM	2XX	Transfer Elective Course	T	3.000	0.00		
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MATH	106	Elem Probability/Statistics	T	3.000	0.00		
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MATH	111	Calculus I	T	4.000	0.00		
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MATH	112	Calculus II	T	4.000	0.00		
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	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA	
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Current Term:	0.000	0.000	19.000	0.000	0.00	0.00	
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Unofficial Transcript							
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INSTITUTION CREDIT							
-Top-							

Term: Fall 2019							
Additional Standing:		Dean's List					

Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	R
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DATA	100	UG	Breaking Intuition	A	4.000	16.00	
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MATH	211	UG	Linear Algebra	A	3.000	12.00	
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PHYS	101L	UG	General Physics-Lab	A	1.000	4.00	
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PHYS	101P	UG	General Physics I	A	3.000	12.00	
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PHYS	171	UG	Planetary & Stellar Astronomy	A	3.000	12.00	
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Term Totals (Undergraduate)								
			Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA

Current Term:			14.000	14.000	14.000	14.000	56.00	4.00
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Cumulative:			14.000	14.000	14.000	14.000	56.00	4.00
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Unofficial Transcript							
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Term: Spring 2020							
Term Comments:		Pass/Fail and withdrawal grading were adjusted in Spring 2020 due to the COVID-19 pandemic.					

Additional Standing:		Dean's List					
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Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	R
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CLCV	228	UG	History of Ancient Rome	A-	3.000	11.10	
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HIST	150	UG	Pirates of the Atlantic	A	4.000	16.00	
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MATH	214	UG	Foundations of Math	A	3.000	12.00	
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PHYS	102L	UG	General Physics-Lab	A-	1.000	3.70	
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PHYS	102P	UG	General Physics II	A	3.000	12.00	
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Term Totals (Undergraduate)								
			Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA

Current Term:			14.000	14.000	14.000	14.000	54.80	3.91
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Cumulative:			28.000	28.000	28.000	28.000	110.80	3.95
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Unofficial Transcript							
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Term: Summer 2020							
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Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	R
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COLL	300	UG	Talking about Climate Change	A	3.000	12.00	
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Term Totals (Undergraduate)								
			Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA

Current Term:			3.000	3.000	3.000	3.000	12.00	4.00
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Cumulative:			31.000	31.000	31.000	31.000	122.80	3.96
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Unofficial Transcript							
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Term: Fall 2020							
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Additional Standing:		Dean's List					
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Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	R
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MATH	302	UG	Ordinary Differential Equation	A	3.000	12.00	
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MATH	311	UG	Elementary Analysis	A	3.000	12.00	
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PHYS	201	UG	Modern Physics	A	4.000	16.00	
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PHYS	251	UG	Experimental Atomic Physics	A	2.000	8.00	
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PHYS	255	UG	Sophomore Research	A	1.000	4.00	
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Term Totals (Undergraduate)								
			Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA

Current Term:			13.000	13.000	13.000	13.000	52.00	4.00
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Cumulative:			44.000	44.000	44.000	44.000	174.80	3.97
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Unofficial Transcript							
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Term: Spring 2021							
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Additional Standing:		Dean's List					
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Subject	Course	Level	Title	Grade	Credit Hours	Quality Points	R
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MATH	307	UG	Abstract Algebra	A	3.000	12.00	
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MATH	442	UG	Partial Differential Equations	A	3.000	12.00	
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PHYS	208	UG	Classical Mech Partic/Waves I	A	4.000	16.00	
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PHYS	252	UG	Electronics	A-	2.000	7.40	
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PHYS	255	UG	Sophomore Research	A	1.000	4.00	
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Term Totals (Undergraduate)								
			Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA

Current Term:			13.000	13.000	13.000	13.000	51.40	3.95
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Cumulative:			57.000	57.000	57.000	57.000	226.20	3.96
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Unofficial Transcript							
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TRANSCRIPT TOTALS (UNDERGRADUATE)								
			Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA

Total Institution:	57.000	57.000	57.000	57.000	226.20	3.96		
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Total Transfer:	0.000	0.000	50.000	0.000	0.00	0.00		
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Overall:	57.000	57.000	107.000	57.000	226.20	3.96		
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SULI PROGRAM APPLICATION RECOMMENDATION FOR PAUL ANDERSON

Recommender Contact Information

- **First Name:** Christopher
- **Last Name:** Monahan
- **Title:** Assistant Professor
- **Department:** Department of Physics
- **Institution/Organization:** William & Mary
- **Telephone:** 757-221-2081
- **Email:** cjmonahan@wm.edu

Applicant Information

Association

Describe your relationship to the applicant, including how long you've known the applicant, where, and in what capacity.

I have known Paul Anderson for approximately nine months, and served as his research advisor for his summer research as a Monroe Scholar at William & Mary this summer.

Applicant Comments

Please provide substantive comments about the applicant's education, training, aptitude, or promise relevant to the SULI program. Include any relevant additional detail or perspective regarding the applicant's research experience or equivalent experience on complex projects, including the level of independence or other factors that would contribute to the applicant's ability to make an excellent contribution to the SULI program.

With great pleasure that I enthusiastically support Paul Anderson's application for the Science Undergraduate Laboratory Internship program. I worked with Paul as his research advisor for his summer research at William & Mary, funded by his Monroe Scholarship, and he is clearly an exceptional student.

Summer research was certainly at the level of a senior undergraduate student, a remarkable achievement for a student then finishing his sophomore year. Paul studied the normal Casimir effect, a long-range effect in nonrelativistic hydrodynamics that is generated by microscopic stochastic thermal fluctuations, in both the parallel-plane and re-entrant-plane geometries. His perturbative solutions to the Landau equations that govern this effect in stochastic hydrodynamics represent novel research results, that, to my knowledge, have not appeared in the literature.

At the start of the summer, Paul had only just completed a course on Partial Differential Equations, but he was very quickly able to apply his coursework to his project and devise new applications of his knowledge. He is mathematically very talented and has consistently demonstrated the skills necessary for a successful academic career in graduate school and beyond. He is organized, very motivated and disciplined, maintains excellent notes and has strong communication skills. Throughout his research, he has taken the initiative when addressing research problems and shows impressive independence and originality in his work with me. Moreover, he is a pleasure to work

e no doubt that he will be able to carry out significant new work as part of his research and that his summer research will be highly successful. In summary, I
 asiastically support Paul’s application for the Science Undergraduate Laboratory Internship program.

Applicant Rating

In comparison to other undergraduate students, please rate the applicant relative to his/her peers on the following qualifications:

	Do Not Know	Below Average	Average	Above Average	Superior
Analytical and Mathematical					X
Experimental Research	X				
Overall Academic					X
Initiative and Self Reliance				X	
Motivation toward Scientific Career				X	
Originality of Thought					X
Emotional Maturity	X				
Ability to Work with Others				X	
Potential for Leadership	X				
Oral Communication Skills				X	
Written Communication Skills				X	

SULI PROGRAM APPLICATION RECOMMENDATION FOR PAUL ANDERSON

Recommender Contact Information

- **First Name:** Joshua
- **Last Name:** Erlich
- **Title:** Professor
- **Department:** Physics
- **Institution/Organization:** William & Mary
- **Telephone:** 757-221-3763
- **Email:** jxerli@wm.edu

Applicant Information

Association

Describe your relationship to the applicant, including how long you've known the applicant, where, and in what capacity.

I have been Paul Anderson's academic advisor since his Freshman year, and was his research advisor in his Sophomore year. Paul was also in my problem session for his Freshman physics course. I originally met Paul when he was a high-school senior and he presented on his experience in a Virginia Space Grant-supported program to the Virginia Space Grant Consortium Advisory Council. Paul impressed me so much that I encouraged him to come to William & Mary, and I was delighted when he decided to attend and major in Physics.

Applicant Comments

Please provide substantive comments about the applicant's education, training, aptitude, or promise relevant to the SULI program. Include any relevant additional detail or perspective regarding the applicant's research experience or equivalent experience on complex projects, including the level of independence or other factors that would contribute to the applicant's ability to make an excellent contribution to the SULI program.

Paul Anderson is one of the most impressive undergraduates I have met in my seventeen years as a professor at William & Mary. He is gifted academically, and he has been incredibly motivated to pursue a variety of research opportunities in order to settle on the field he believes he will best contribute to. He has a stronger mathematical background than many physics students, and I expect him to pursue a career in a theoretical subfields. He has overcome a physical challenge to thrive academically. He would thrive as a part of any theory or analysis project supported by the SULI program.

I am Paul Anderson's academic advisor, and he also did research with me on a stochastic approach to quantum mechanics and quantum field theory, with an eye towards quantum gravity. Paul performed simulations of stochastic processes intended to correspond to states of quantum systems, and I was highly impressed by his ability to quickly pick up new computational techniques. Paul has interest in nuclear and particle theory, as well as more applied subfields. I am confident that Paul will be successful in whatever subfield he chooses to focus on. As a participant in the SULI program, Paul would be dedicated and focused, and would be a strong contributor to whatever project he is assigned to. He has my strongest recommendation.

Applicant Rating

In comparison to other undergraduate students, please rate the applicant relative to his/her peers on the following qualifications:

	Do Not Know	Below Average	Average	Above Average	Superior
Analytical and Mathematical					X
Experimental Research			X		
Overall Academic					X
Initiative and Self Reliance					X
Motivation toward Scientific Career					X
Originality of Thought					X
Emotional Maturity				X	
Ability to Work with Others				X	
Potential for Leadership					X
Oral Communication Skills					X
Written Communication Skills				X	