

Science Undergraduate Laboratory Internships (SULI)

Summer 2022 - Application for: Richard Marvin Whitehill

APPLICANT PROFILE

General Applicant Information

First Name: Richard

Middle Name: Marvin

Last Name: Whitehill

Previous Last Name(s):

Primary Email Address: richard.whitehill@cox.net

Alternate Email Address 1: whiteric@jlab.org

Alternate Email Address 2:

ORCID: [0000-0001-5007-2473](https://orcid.org/0000-0001-5007-2473)

Current Address

Primary Phone Number: 316-617-9199

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

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EDUCATIONAL BACKGROUND

Academic Information

Are you currently attending a community college or 2-year college?

No

Current academic status:

Senior

If you are selected as a participant in this DOE program, will you receive academic credit from your university/college for participating?

No

Science Undergraduate Laboratory Internships (SULI)

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Undergraduate Institution Information

College/University Country:	United States and U.S. Territories
College/University State/Province/Territory:	Kansas
College/University Name:	Wichita State University
College/University Address:	1845 Fairmount St
College/University City:	Wichita
College/University Zip Code:	67260-0001
Expected/Declared Major:	<ul style="list-style-type: none"> Physical Sciences - Physics Mathematics
Minor and/or Concentration Expected/Declared:	Computer Sciences and Information Technology
Expected Degree From This College/University:	Bachelor's
Expected/Completed Graduation Date:	May / 2023
Transcript:	WSU_Transcript2022.pdf
Does this institution provide grades?	Yes
GPA Scale:	4.0
Total Attempted Credits:	47.00
Total Earned Credits:	47.00
Total Quality Points:	188.00
GPA:	4.00

College/University Country:	United States and U.S. Territories
College/University State/Province/Territory:	Kansas
College/University Name:	Fort Hays State University
College/University Address:	600 Park St
College/University City:	Hays
College/University Zip Code:	67601-4099
Expected/Declared Major:	Undeclared
Expected Degree From This College/University:	None (transfer credit earned)
Expected/Completed Graduation Date:	N/A
Transcript:	FHSU_Transcript2020.pdf
Does this institution provide grades?	Yes
GPA Scale:	4.0
Total Attempted Credits:	74.00
Total Earned Credits:	74.00
Total Quality Points:	295.00



Science Undergraduate Laboratory Internships (SULI)

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GPA:	3.99
Overall Cumulative GPA:	3.99

Science Undergraduate Laboratory Internships (SULI)

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Science, Technology, Engineering and Mathematics (STEM) Courses

Course Title: Advanced Calculus 1

Course Number: 547

Enrollment Status: Recently Completed

Course Title: Advanced Physics Lab

Course Number: 516

Enrollment Status: Recently Completed

Course Title: Calculus 3

Course Number: 344

Enrollment Status: Recently Completed

Course Title: Classical Mechanics

Course Number: 621

Enrollment Status: Recently Completed

Course Title: Computational Physics Lab

Course Number: 616

Enrollment Status: Currently Enrolled

Course Title: Differential Equations 1

Course Number: 555

Enrollment Status: Recently Completed

Course Title: Electricity and Magnetism

Course Number: 631

Enrollment Status: Currently Enrolled

Course Title: Fundamental Concepts of Algebra

Course Number: 513

Enrollment Status: Currently Enrolled

Course Title: General Biology 1

Course Number: 210

Enrollment Status: Recently Completed

Course Title: General Chemistry

Course Number: 211

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Enrollment Status:	Recently Completed
Course Title:	General Chemistry 2
Course Number:	212
Enrollment Status:	Recently Completed
Course Title:	Intro to Advanced Mathematics
Course Number:	415
Enrollment Status:	Recently Completed
Course Title:	Introduction to Complex Variables
Course Number:	548
Enrollment Status:	Recently Completed
Course Title:	Linear Algebra
Course Number:	511
Enrollment Status:	Recently Completed
Course Title:	Modern Physics
Course Number:	548
Enrollment Status:	Recently Completed
Course Title:	Numerical Methods
Course Number:	551
Enrollment Status:	Currently Enrolled
Course Title:	Physics for Scientists 1
Course Number:	313
Enrollment Status:	Recently Completed
Course Title:	Physics for Scientists 2
Course Number:	314
Enrollment Status:	Recently Completed
Course Title:	Quantum Mechanics 1
Course Number:	651
Enrollment Status:	Recently Completed
Course Title:	Quantum Mechanics 2

Science Undergraduate Laboratory Internships (SULI)

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Course Number:	652
Enrollment Status:	Recently Completed
Course Title:	Thermophysics
Course Number:	641
Enrollment Status:	Recently Completed
Awards or Honors	
Award Title:	National Merit Finalist
Month & Year Received:	May / 2020
Awarding Institution:	National Merit Scholarship Corporation
Award Title:	Dean's List
Month & Year Received:	May / 2020
Awarding Institution:	Fort Hays State University
Award Title:	Dean's List
Month & Year Received:	December / 2021
Awarding Institution:	Wichita State University
High School Graduation or GED	
Date of High School Graduation or GED:	May / 2020
Country:	United States
City:	Goddard
State/Province/Territory:	KS

Science Undergraduate Laboratory Internships (SULI)

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WORK EXPERIENCE & SKILLS

Work Experience

Name of Place of Employment or Activity:	Jefferson Lab
Dates of Employment or Activity:	From 6/1/2021 To Present
Hours Per Week:	10.0
Primary Duties:	For the past half-year, I have been working with Wally Melnitchouk and Nobuo Sato on a research project, first started during my REU internship during the summer of 2021. I have performed theoretical calculations to determine if a possible future experiment can give significant insight into the structure of the proton.
Tasks Performed:	Created Python scripts and appended Jupyter notebooks to perform computations.

Professional Associations

Are you a member of any professional organizations?	Yes
Professional associations you are affiliated with:	Society of Physics Students

Computer Skills

Computer related skills:	I have multiple years of experience in the Microsoft software applications, python, and LaTeX. I also have a basic knowledge of C++, Wolfram Mathematica, and MATLAB.
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Science Undergraduate Laboratory Internships (SULI)

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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? 5/16/2022

When do you need to complete your
internship? 8/19/2022

First Choice Host DOE Laboratory

DOE Laboratory: Thomas Jefferson National Accelerator Facility (TJNAF)

First Choice Research Area: Nuclear Physics

Second Choice Research Area: Nuclear Science

Third Choice Research Area: High Energy Physics

Second Choice Host DOE Laboratory

DOE Laboratory: Brookhaven National Laboratory (BNL)

First Choice Research Area: Nuclear Physics

Second Choice Research Area: Nuclear Science

Third Choice Research Area: High Energy Physics

Relatives Employed at DOE Laboratories

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

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ESSAYS

Research Experience:	<p>Over the last few years, I have been involved in three substantial research projects. My first experience was at Fort Hays State University (FHSU) under the direction of Dr. C.D. Clark III. For this project, we looked at a simple classical mechanics problem, attempting to answer the question "Why do baseball hitters often see a curveball drop dramatically all of a sudden?". To answer this question, we programmed a differential equation solver in Python to simulate the trajectory of a baseball being thrown by a pitcher and a machine-learning algorithm to serve as a hitter, predicting the trajectory of a pitch. For these projects, I developed most of the necessary mathematical framework for the computations and constructed the differential equation solver from scratch.</p> <p>My second project was also under the guidance of Dr. Clark at FHSU. This project looked at developing a Perfectly Matched Layer method for the heat diffusion equation, which is a partial differential equation describing heat flow in different materials and is relevant in fields such as biological physics. For this, we tested multiple potential methods. This required me to develop the numerical methods for solving the heat equation for the relevant geometries and boundary conditions and implement them in a computer program.</p> <p>For my third project, I have been working with Wally Melnitchouk, Nobuo Sato, and Yiyu Zhou in the theory center at Jefferson Lab. We have been attempting to analyze the potential of semi-inclusive deep inelastic scattering (SIDIS) experiments to better constrain the polarized gluon parton distribution function (PGPDF). To do this, we have been working in perturbative quantum chromodynamics to calculate relevant quantities for the SIDIS process, which depend on the PGPDF. Multiple python scripts have been crafted to perform these analytical and numerical calculations, and we are nearing the conclusion of the project and hoping to prepare a short paper for publication in the next few months.</p>
Research Interests:	<p>I am strongly interested in theoretical nuclear physics. The work being done to develop the theory of the strong force, quantum chromodynamics (QCD), and map the structure of the proton is quite exciting. Historically, the proton was treated as a fundamental particle. Experimental and theoretical results, however, convincingly indicate that protons are composite particles, made up of many partons (quarks and gluons). The quark and gluon structure of the proton is quite complex, and there are many open questions about how the proton structure gives rise to its observed properties, which would be quite compelling to study.</p> <p>In particular, I am very interested in the work relevant to the Jefferson Lab Angular Momentum Collaboration (JAM), which my current project falls under the scope of. This group is attempting to understand the angular momentum structure of the proton. Essentially, they are working to understand how the quark and gluon structure of the proton gives the proton its half-integral spin. The work being done to extract quantum correlation functions from previous scattering experiments, look at future scattering experiments to better constrain these functions, and further develop methods to better obtain these structure functions is extremely interesting. I am hoping to continue my work this upcoming summer to learn more about the partonic structure of the proton and nuclear physics in general.</p>
Personal Experience:	<p>I believe that my two strongest attributes are my strong desire to learn and my work ethic. That is, I have an intense drive to learn about physics and physics research, especially nuclear and high energy physics, and I am willing to put in the work to pick up the skills and knowledge relevant to a research project. Additionally, I have a strong and broad base of skills from previous courses, independent study, and previous research experiences, including fundamental physics and computational knowledge, which have and will help me accomplish the goals associated with the research project on which I am working. From my academic courses and prior research experience, I am accustomed to collaborating with others. This means that I understand how to communicate with my peers and colleagues in order to share and separate the workload in order to solve problems and produce results effectively and efficiently. For these reasons, I believe that my prior experiences and personal characteristics will make me a good contributor to the SULI program.</p>
Professional Goals:	<p>Long-term I am hoping to perform academic research in high energy physics, particularly in either nuclear or particle physics. Furthermore, I believe that I would like to obtain a faculty position at a university to teach at the same time. The SULI program provides a perfect opportunity for me to gain critical experience that will prove invaluable in helping me achieve my future goals. Firstly, by participating in a research project in the SULI program, I will directly gain hands-on experience in the research process which will be critical in my future research work. Secondly, the program will help me make connections with people involved in nuclear physics, which is crucial given that research has become an incredibly collaborative environment, and lastly, the SULI program will give me an opportunity to expand my physics knowledge and develop more computational skills, both of which are indispensable in physics research.</p> <p>Each of these components will make me a stronger physicist and researcher, which will help me in applying to a Ph.D. program in physics and succeeding in such a program. Success in a PhD program will help me obtain postgraduate positions and ultimately a permanent position at a research institution, facility, or lab. Thus, the SULI program will serve as a strong foundation to help me achieve my goal of being a lifelong physics learner, contributing to the knowledge of the physics community, and furthering our understanding of the structure and</p>

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behavior of nature.

RECOMMENDATIONS

Recommendation 1: **First Name:** Nobuo
Last Name: Sato
Email: nsato@jlab.org
Status: Received 1/11/2022

Recommendation 2: **First Name:** Wally
Last Name: Melnitchouk
Email: wmelnitc@jlab.org
Status: Received 1/11/2022

Whitehill, Richard M*Matriculation:* Fall 18*High School:* Eisenhower High School, Goddard, Ks (Class of '20)**Summer 2018: Butler County CC, El Dorado, KS**

Dept	Num	Sec	Title	Grade	Sem Hrs	Sem Pts	Repeat
EG	101	101	English Comp I	A	3.0	12.0	
HS	132	132	U.S. History II	A	3.0	12.0	

Semester UG Hrs: 6.0 Pts: 24.0 GPA: 4.00 Hours Passed: 6.0

Fall 2018: College Board Advanced Placement

Dept	Num	Sec	Title	Grade	Sem Hrs	Sem Pts	Repeat
MATH	234	234	Analytic Geometry and Calculus I	CR	5.0	0.0	
MATH	235	235	Analytic Geometry and Calculus II	CR	5.0	0.0	

Fall 2018: Fort Hays State University, Hays, KS - Deans Honor Roll

Dept	Num	Sec	Title	Grade	Sem Hrs	Sem Pts	Repeat
CHEM	120	C	University Chemistry I	A	3.0	12.0	
CHEM	120L	C	University Chemistry Laboratory I	A	2.0	8.0	
ENG	102 *	I	English Composition II	A	3.0	12.0	
GSCI	357	A	Tps/Geosciences: Early College Research Seminar	A	1.0	4.0	
GSCI	376	A	Appr/GeoSci: Earth Space Science Research & Writing	A	3.0	12.0	
MATH	236		Analytic Geometry and Calculus III	A	3.0	12.0	
MATH	250 *	A	Elements of Statistics	A	3.0	12.0	

Semester UG Hrs: 18.0 Pts: 72.0 GPA: 4.00 Hours Passed: 18.0

Spring 2019: Fort Hays State University, Hays, KS - Deans Honor Roll

Dept	Num	Sec	Title	Grade	Sem Hrs	Sem Pts	Repeat
BIOL	180	B	Principles of Biology	A	3.0	12.0	
BIOL	180L	D	Principles of Biology Laboratory	A	1.0	4.0	
BIOL	471	E	Problems in Biology (Research): Osteology	A	1.0	4.0	
MATH	240		Linear Algebra	A	3.0	12.0	
MATH	354		Differential Equations	A	3.0	12.0	
MATH	673	A	Problems: KAMS Research	B	1.0	3.0	
PHYS	211		Engineering Physics I	A	4.0	16.0	
PHYS	211L	C	Engineering Physics I Laboratory	A	1.0	4.0	
PHYS	603	A	Projects I: Magnus Force Simulations	A	1.0	4.0	
POLS	101 *	B	American Government	A	3.0	12.0	

Semester UG Hrs: 21.0 Pts: 83.0 GPA: 3.95 Hours Passed: 21.0

Fall 2019: Fort Hays State University, Hays, KS - Deans Honor Roll

Dept	Num	Sec	Title	Grade	Sem Hrs	Sem Pts	Repeat
HIST	130 *	A	United States History to 1877	A	3.0	12.0	
MATH	301		Introduction to Proof	A	3.0	12.0	
PHYS	212		Engineering Physics II	A	4.0	16.0	
PHYS	212L	A	Engineering Physics II Laboratory	A	1.0	4.0	
PHYS	333		Introduction to Computational Physics	A	3.0	12.0	
PHYS	620		Mathematics for the Physical Sciences	A	3.0	12.0	

Semester UG Hrs: 17.0 Pts: 68.0 GPA: 4.00 Hours Passed: 17.0

Spring 2020: Fort Hays State University, Hays, KS - Deans Honor Roll

Dept	Num	Sec	Title	Grade	Sem Hrs	Sem Pts	Repeat
ENG	125 *	E	World Literature and the Human Experience	A	3.0	12.0	
PHYS	313		Modern Physics	A	3.0	12.0	
PHYS	621		Mechanics	A	3.0	12.0	
PSY	100 *	B	General Psychology	A	3.0	12.0	

Semester UG Hrs: 12.0 Pts: 48.0 GPA: 4.00 Hours Passed: 12.0

Cumulative UG Hrs: 74.0 **Pts:** 295.0 **GPA:** 3.98 **Hours Passed:** 84.0**Cumulative GR Hrs:** 0.0 **Pts:** 0.0 **GPA:** 0.00 **Hours Passed:** 0.0**FHSU UG Hrs:** 68.0 **Pts:** 271.0 **GPA:** 3.98 **Hours Passed:** 68.0**FHSU GR Hrs:** 0.0 **Pts:** 0.0 **GPA:** 0.00 **Hours Passed:** 0.0

* General Education course

Cumulative hours include hours failed and are used in computing GPA; Grades of P and CR are not included but are included in hours passed.

****** END OF TRANSCRIPT ******

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Wichita State University

Academic Transcript

Richard M. Whitehill

 This is not an official transcript.

- Courses numbered below 100 are not college level courses
- Only EARNED hours can count toward a degree
- In the R column on the right:
E = this grade and hours are excluded from GPA and Earned hours
I = this grade and hours are included in GPA and Earned hours
A = this grade and hours are included in GPA but not Earned hours
- Contact your college office if you think your degree or program information is incorrect.

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

Transcript Data

STUDENT INFORMATION

Name : Richard M. Whitehill

Curriculum Information

Current Program

College: Liberal Arts and Sciences

Major and Department: Physics BS, Math, Statistics, & Physics

Major and Department: Mathematics BS, Math, Statistics, & Physics

Minor: Computer Science

Track: Emory Lindquist Honors Scholar

***Transcript type:Self-Service UNOFFICIAL is NOT Official ***

TRANSFER CREDIT ACCEPTED BY INSTITUTION [-Top-](#)

Summer Credit by Exam - AP
2020:

Subject Course	Title	Grade	Credit Hours	Quality Points	R
MATH 242	Calculus I	TCRE	5.000		0.000
MATH 243	Calculus II	TCRE	5.000		0.000
Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA



Current Term: 0.000 10.000 10.000 0.000 0.000 0.000

Unofficial Transcript

Summer 2018: Butler Community College

Subject Course	Title	Grade	Credit Hours	Quality Points	R
ENGL 101	College English I	TA	3.000	12.000	
HIST 132	U S Since 1865	TA	3.000	12.000	
		Attempt Hours	Passed Hours	Earned GPA Hours	Quality GPA Points
Current Term:		6.000	6.000	6.000	24.000
					4.000

Unofficial Transcript

Fall 2018: Fort Hays State University

Subject Course	Title	Grade	Credit Hours	Quality Points	R
CHEM 211	General Chemistry I	TA	3.000	12.000	
CHEM 211L	General Chemistry I Lab	TA	2.000	8.000	
ENGL 102	College English II	TA	3.000	12.000	
GEOG 4000	GSCI 376-Apprenticeship/Geosci	TA	3.000	12.000	I
GEOL 690	Special Studies Geology	TA	1.000	4.000	
MATH 344	Calculus III	TA	3.000	12.000	
STAT 370	Elementary Statistics	TA	3.000	12.000	
		Attempt Hours	Passed Hours	Earned GPA Hours	Quality GPA Points
Current Term:		18.000	18.000	18.000	72.000
					4.000

Unofficial Transcript

Spring 2019: Fort Hays State University

Subject Course	Title	Grade	Credit Hours	Quality Points	R
BIOL 210	General Biology I	TA	4.000	16.000	
BIOL 499	Undergrd Research	TA	1.000	4.000	
MATH 511	Linear Algebra	TA	3.000	12.000	
MATH 555	Differential Equations I	TA	3.000	12.000	
MATH 6000	MATH 673-Problems	TB	1.000	3.000	I
PHYS 313	Physics for Scientists I	TA	4.000	16.000	
PHYS 315	University Physics Lab I	TA	1.000	4.000	
PHYS 600	Indiv Readings Physics	TA	1.000	4.000	
POLS 121	American Politics	TA	3.000	12.000	
		Attempt Hours	Passed Hours	Earned GPA Hours	Quality GPA Points
Current Term:		21.000	21.000	21.000	83.000
					3.952





Unofficial Transcript

Fall 2019: Fort Hays State University

Subject	Course	Title	Grade	Credit Hours	Quality Points	R
HIST	131	US:Colonial to 1865	TA	3.000	12.000	
PHIL	4000	MATH 301-Elem Math Logic	TA	3.000	12.000	I
PHYS	314	Physics for Scientists II	TA	4.000	16.000	
PHYS	316	University Physics Lab II	TA	1.000	4.000	
PHYS	4000	PHYS 333-Intro Computnl Physic	TA	3.000	12.000	I
PHYS	6000	PHYS 620-Math for Phys Science	TA	3.000	12.000	I
		Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality GPA Points
Current Term:		17.000	17.000	17.000	17.000	68.000
						4.000

Unofficial Transcript

Spring 2020: Fort Hays State University

Subject	Course	Title	Grade	Credit Hours	Quality Points	R
ENGL	2000	ENG 125-World Lit/Hum Exp	TA	3.000	12.000	I
PHYS	551	Topics in Modern Physics	TA	3.000	12.000	
PHYS	621	Elem Mechanics I	TA	3.000	12.000	
PSY	111	General Psychology	TA	3.000	12.000	
		Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality GPA Points
Current Term:		12.000	12.000	12.000	12.000	48.000
						4.000

Unofficial Transcript

Summer 2020: Credit by Exam - ACT

Subject	Course	Title	Grade	Credit Hours	Quality Points	R
MATH	111	College Algebra	TCRE	3.000	0.000	
		Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality GPA Points
Current Term:		0.000	3.000	3.000	0.000	0.000
						0.000

Unofficial Transcript

INSTITUTION CREDIT -Top-

Term: Fall 2020

Major: Physics BS

Academic Standing: Good Standing



Additional Standing: Dean's List

Subject Course Level Title				Grade	Credit Hours	Quality R
					Points	
ARTH	103	UG	Art Appreciation	A	3.000	12.000
COMM	111	UG	Public Speaking	A	3.000	12.000
MATH	548	UG	Intro to Complex Variables	A	3.000	12.000
PHYS	641	UG	Thermophysics	A	3.000	12.000
PHYS	651	UG	Quantum Mechanics I	A	3.000	12.000
				Attempt	Passed	Earned
				Hours	Hours	Hours
				GPA	Quality	GPA
				Hours	Points	Hours
Current Term:				15.000	15.000	15.000
Cumulative:				15.000	15.000	15.000
				15.000	60.000	4.000
				15.000	60.000	4.000

Unofficial Transcript

Term: Spring 2021

Major: Physics BS
Academic Standing: Good Standing
Additional Standing: Dean's List

Subject Course Level Title				Grade	Credit Hours	Quality R
					Points	
CHEM	212	UG	General Chemistry II	A	5.000	20.000
HNRS	305J	UG	Minds and Machines	A	3.000	12.000
MATH	415	UG	Intro Advanced Mathematics	A	3.000	12.000
PHYS	195	UG	Intro Modern Astronomy	A	3.000	12.000
PHYS	652	UG	Quantum Mechanics II	A	3.000	12.000
				Attempt	Passed	Earned
				Hours	Hours	Hours
				GPA	Quality	GPA
				Hours	Points	Points
Current Term:				17.000	17.000	17.000
Cumulative:				32.000	32.000	32.000
				17.000	68.000	4.000
				32.000	128.000	4.000

Unofficial Transcript

Term: Fall 2021

Major: Physics BS
Academic Standing: Good Standing
Additional Standing: Dean's List

Subject Course Level Title				Grade	Credit Hours	Quality R
					Points	
CS	211	UG	Introduction to Programming	A	4.000	16.000
HNRS	306I	UG	AGE: OK Boomer & Beyond	A	3.000	12.000
MATH	451	UG	Comput Math using MATLAB	A	3.000	12.000
MATH	547	UG	Advanced Calculus I	A	3.000	12.000
PHYS	516	UG	Advanced Physics Lab	A	2.000	8.000
				Attempt	Passed	Earned
				Hours	Hours	Hours
				GPA	Quality	GPA
				Hours	Points	
Current Term:				15.000	15.000	15.000
Cumulative:				47.000	47.000	47.000
				15.000	60.000	4.000
				47.000	188.000	4.000

Unofficial Transcript

TRANSCRIPT TOTALS (UNDERGRADUATE) -Top-

	Attempt Hours	Passed Hours	Earned Hours	GPA Hours	Quality Points	GPA
Total Institution:	47.000	47.000	47.000	47.000	188.000	4.000
Total Transfer:	74.000	87.000	87.000	74.000	295.000	3.986
Overall:	121.000	134.000	134.000	121.000	483.000	3.991

Unofficial Transcript

COURSES IN PROGRESS -Top-

Term: Spring 2022

Major: Physics BS

Subject Course Level Title				Credit Hours
CS	311	UG	Object-Oriented Programming	4.000
MATH	513	UG	Fund Concepts of Algebra	3.000
MATH	551	UG	Numerical Methods	3.000
PHYS	616	UG	Computational Physics Lab	2.000
PHYS	631	UG	Electricity and Magnetism	3.000

Unofficial Transcript

RELEASE: 8.7.1

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SULI PROGRAM APPLICATION RECOMMENDATION FOR RICHARD MARVIN WHITEHILL

Recommender Contact Information

- **First Name:** Wally
- **Last Name:** Melnitchouk
- **Title:** Dr
- **Department:** Theory Center
- **Institution/Organization:** Jefferson Lab
- **Telephone:** 757-692-6881
- **Email:** wmelnitc@jlab.org

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 Richard for about 1/2 a year, since his REU internship at Jefferson Lab/Old Dominion University in the summer of 2021, when I was his mentor.

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.

During his internship at Jefferson Lab/ODU, Richard worked on a nuclear physics project to develop a new method of determining the gluon polarization in the nucleon, involving polarized semi-inclusive deep-inelastic scattering (SIDIS) at large transverse momentum. This process has sensitivity to polarized gluons at the same order as polarized quarks, in contrast to the more common inclusive deep-inelastic scattering process in which the gluon contribution is suppressed by an additional power of the strong coupling. With little formal background in theoretical nuclear physics, Richard learned the basics of Feynman diagrams and the calculation of scattering cross sections within a few weeks of the start, and was able to verify some existing results in the literature. He then proceeded to computing the spin-dependent cross sections for various channels involving scattering from quarks and gluons.

In addition to his analytical work, Richard also worked on developing computer code to perform numerical simulations of the scattering cross sections, which will be necessary to assess the impact of future SIDIS data from the Electron-Ion Collider on the polarization. He has been a very competent and careful programmer, and has contributed significantly to the development of the code.

Since returning to his home university, Richard has continued working on the project, meeting with me and my collaborators at Jefferson Lab frequently to move the project forward. The work is expected to be completed in 2022, and will be submitted for publication in Physical Review D.

My overall assessment of Richard is of a highly motivated student, who has the capability and initiative to "take charge" of a project

and move it forward, with minimum supervision. I can very strongly recommend him for admission into the SULI program for 2022.

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 RICHARD MARVIN WHITEHILL

Recommender Contact Information

- **First Name:** Nobuo
- **Last Name:** Sato
- **Title:** Dr.
- **Department:** Theory Center
- **Institution/Organization:** Jefferson Lab
- **Telephone:** 850-559-1664
- **Email:** nsato@jlab.org

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 Richard since Summer 2021 when he did an REU with us. I have worked closely with him for the a research project I proposed on nucleon spin-physics. The goal of the project was to compute short distance polarized partonic cross section for polarized semi-inclusive DIS which is a possible channel to be measured at Jefferson Lab as well as the future EIC. Richard is really extraordinary, and he demonstrated his abilities to do independent study and get all the concepts (typically acquired in a graduate QFT program) needed for the project.

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.

Richard is certainly qualified for the SULI program as he has demonstrated strong skills and affinity for theoretical particle physics during the last summer. Among all SULI/REU interns that I have had in the past, I will place him within the top 3. His career path is certainly moving in the right direction. He is quite independent in terms of learning concepts and has excellent communication skills in a collaborative project environment. I strongly support his application for the SULI 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