

Luke Dorrian
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I was not lucky enough to grow up on the coast. My family would often take vacations to the beach but at that time the ocean was simply a place to build sandcastles next to. Only after learning about the massive chemical and biological processes occurring within the oceans that keeps our planet alive did I begin to be fascinated by them. I recently decided to explore a career in ocean sciences and engineering after a trip to the Big Island in Hawai'i. There, I toured a company called Makai Ocean Engineering, where I was captivated by their ongoing OTEC project, which uses the temperature gradient between surface and deep ocean water to generate clean power. After that trip, I sought to learn more about the various careers involving the ocean and what I'd need to be a viable applicant for those positions. I needed to explore these fields through my electives and engineering courses. I couldn't do that within the engineering program at Loyola University Chicago, so I transferred to the Georgia Institute of Technology in the Fall 2019 semester. Since then, I've picked up a minor in Ocean Sciences and a volunteer position at the Georgia Aquarium where I'm training for positions that involve the facility's pumps and life support systems. I've also joined the Marine Robotics Club at Georgia Tech where I'm helping research and develop a hydrophone system for its vehicles using my knowledge of CAD software. I'm exploring the different applications of this field and hope to further do so through the 2020 Summer Internship Program at MBARI.

I can't imagine a more exciting place to begin my career in ocean sciences than at the Monterey Bay Aquarium. As a participant in this program, I get the perfect opportunity to explore one or several fields within ocean sciences and/or engineering. I also look forward to meeting people who have similar interests in ocean sciences and conservation. I've already begun to meet other volunteers and staff at the Georgia Aquarium who have this passion. Being around people who share this passion is energizing and I believe that the connections and discoveries I will make at MBARI will ultimately benefit me both professionally and personally.

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I have the aptitude for research because I am a naturally curious person. I always want to understand why something happened and what could have changed that outcome. If I can't be given a reason, I formulate a hypothesis of my own based on what I already know. I put my own theories into application and work backwards to see if I can achieve the same result. I chose to study engineering in school because I believe it is the best way to apply my skills as a scientist.

I can sustain my curiosity because I learn quickly. I'm highly independent and adaptable, which attributes to my success in both my schoolwork and my research at the Subsurface Processes Laboratory with Dr. Sheng Dai. I started this position with no experience within geotechnical engineering and no knowledge of the software I was going to use. Despite this, I learned and used LabVIEW and Arduino to develop a physical sensor that measures various voltage inputs to calculate the hardness of granite samples at high-temperature, high-pressure conditions. This property is used to evaluate the economic feasibility of Enhanced Geothermal Systems, a new method of geothermal power production available across a much wider range of the country. This semester, I was rehired by Dr. Dai to build a borehole tool to characterize hydrate-carrying sediments. One of the most important skills I developed through this position, beyond proficiency in LabVIEW and Arduino, was my ability to troubleshoot my own devices and how and where to consult the proper resources when I couldn't solve problems on my own.

I also have proficiency in various programming languages such as MATLAB, Java, and C Programming. I've thrived in these courses because I can easily visualize my data for analysis. My technical skill has been recognized through my selection for two separate TA positions, one for teaching MATLAB fundamentals and the other for Java programming. This skill would be especially applicable in any project that involves signal processing, computer simulation, and/or data analysis.

Through the Summer Internship Program at MBARI, I hope to use my current skills to develop new ones while exploring a new field of ocean sciences and/or engineering. I am

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particularly interested in the projects at MBARI that concern large-scale physical and chemical phenomena that are occurring within the ocean like ocean acidification, ocean circulation and the current system, and climate change. These ancient systems and their responses fascinate me. I believe that humanity in its current state is in most need of a better understanding of them than anything else. I hope that my current experience with CAD software, sensor development, and programming not only makes me stand out as an applicant to the 2020 MBARI Summer Internship Program but also lets me hit the ground running as I take my first major steps towards a meaningful career.

I am extremely interested in working with Dr. Andrea Fassbender on her research concerning ocean acidification. On my own time, I have begun to learn about the calcium carbonate buffering system of the ocean and have learned a little about the technical challenges of correctly measuring the pH of our oceans. Although I have learned about some of the chemistry behind ocean acidification, I would particularly like to learn more about analytical and wet chemistry as I do not have that type of experience through my current research. I would also like to gain further experience with sensor development and instrumentation. Finally, the opportunity to participate in field work is also appealing to me; it will help me decide how I want to dedicate my life towards this field. I believe that my proficiency in MATLAB (proven by my position as a TA for a MATLAB fundamentals course), experience with prior physical sensor development using Arduino and LabVIEW, ability to learn new material quickly and independently, and passion for the subject would make me an excellent addition to the project.

I am also extremely interested in working with Dr. Richard Henthorn on his various development projects at MBARI. Dr. Henthorn has listed several different topics that his projects may concern but I'm interested in all of them. In fact, one of the reasons I've chosen to pursue ocean sciences and engineering as a career is because how alien the ocean is to me. Extreme

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environments like mid-ocean trenches and abyssal plains really interest me because I know so little about them. I also have an interest in renewable energy, which sparked my initial interest in the field, so wave energy also interests me. In participating in Dr. Henthorn's research, I hope to become more familiar with the overall design process and to apply the principles taught in my engineering courses while becoming a more holistic engineer and scientist. I believe that I would be an excellent addition to this project because of my previous experience with CAD software and MATLAB, my analytical mindset, and my ability to succeed in both collaborative (in addition to being a TA for two separate computer science courses, I was also a writing tutor at my previous university which taught me how to communicate with people who have fundamentally different speaking and learning styles) and individual settings.

I am very interested in working with Dr. Yui Takeshita on his research in biogeochemical sensor development. I would like to learn more about chemical sensors and analytical chemistry in general and believe that my previous experience with physical sensor development would be very beneficial to the team in this project. I would also like to learn more about autonomous platforms since any potential future career focusing on in-situ sensors will also likely involve marine robotics and artificial intelligence.

I am also interested in assisting Dr. Francisco Chavez with his work on the California Current System. The mechanisms behind currents and their ability to regulate the global climate really interest me. I would love to learn how to quantify the effects of El Niño and other climate phenomena. This project would give me the perfect opportunity to use my proficiency in MATLAB to learn more about data analysis. As with the other projects, I am very excited at the prospect of also doing some fieldwork for my research. Most importantly, the opportunity to gain experience with the scientific writing style and the process behind publishing one's work, which I have not yet

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done in my current position, would be invaluable should I continue a career in research in the future.

Finally, I am interested in joining Dr. Gene Massion with his work on developing autonomous platforms. I have enjoyed my time in the Marine Robotics Club at Georgia Tech researching and developing the hydrophones for our submarine prototype and would like to learn more about the entire design process for these machines. This project would allow me to apply my skills in both MATLAB and Solidworks. I would love to take part in the design process for these projects but am also very interested in learning more about software development and testing. I would love to return from a summer at MBARI with new ideas for projects for the Marine Robotics Club and the knowledge needed to turn those ideas into a reality.

I am extremely excited about the prospect of working for the Monterrey Bay Aquarium. Before finding out about this program, I never was truly excited about an internship, especially for those in ocean engineering in the private sector which generally focus on mining and drilling. I had felt I was sacrificing my passion for a title and work experience to add to my resume. This program, however, has *exactly* what I want out of an entry-level internship. To dive into a new career among like-minded people who share my passion for the ocean, all while living in one of the most beautiful regions of this country is more than I could ever ask for. I would be honored to join the Monterrey Bay Aquarium this summer and can be contacted via ldorrian3@gatech.edu at any time.

Thank you for your time and consideration,

Luke Dorrian

Luke Dorrian

(704)575-0354

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Education

Georgia Institute of Technology, Atlanta, GA

Candidate for B.S. Environmental Engineering, Ocean Sciences Minor

Organizations - Students Organizing for Sustainability, Georgia Tech Marine Robotics Club, Association of Environmental Engineers and Scientists, Georgia Tech Energy Club, Georgia Tech French Club

GPA: 4.00

2019-2022 expected

Loyola University Chicago, Chicago, IL

Candidate for B.S. Engineering Science

GPA: 3.95

2017-2019

Work Experience

College of Computing at Georgia Tech

Teaching Assistant

1/2020 – present

Atlanta, GA

- Teaching assistant for CS1371, a MATLAB fundamentals course
- Taught a weekly recitation and hosted additional office hours for students
- Created and proofed weekly homework assignments
- Helped in the development of software to carry out logistical tasks for the course

Loyola University Chicago Department of Computer Science

Undergraduate Assistant to the Computer Science Department

1/2019 – 5/2019

Chicago, IL

- Worked as a teaching assistant in COMP170, an object-oriented programming class
- Taught students Java programming and strategies to evaluate their own code.
- Created practice problems for students in individual sessions

Research Experience

The Vertically Integrated Projects Program at Georgia Tech

Undergraduate Research Assistant

8/2019 - present

Atlanta, GA

- Participated in experiments measuring physical properties of granite samples at varying temperatures
- Using LabVIEW and Arduino to design an interface in order to optimize the experimental process
- Currently building an RCTS (Combined Resonant Column and Torsional Shear testing apparatus)

Leadership

The Georgia Aquarium

Volunteer

12/2019 – present

Atlanta, GA

- Helping with the day-to-day operations and special events at the Georgia Aquarium
- On-call for non-routine operations when needed
- Currently taking additional training courses in marine biology and ocean sciences through this position

The Institute of Environmental Sustainability at Loyola University Chicago

Biodiesel Program Volunteer

10/2017 – 5/2019

Chicago, IL

- Converted kitchen grease gathered from local cafeterias and restaurants into biodiesel
- Created soap from the glycerin by-product of the initial conversion process
- Manipulated data through Excel to attain said densities and pH values
- Aided in the renovation of storage chambers to optimize shelf life of biodiesel

Skills

Environmental Engineering

Organic Chemistry, Chemistry, Product Design, Statics, Dynamics, Oceanography

Software

AutoCAD, LabVIEW, Microsoft Office, Simulink, Solidworks, Arduino

Programming Languages

C Programming, Java, MATLAB

Spoken Languages

English, French, Russian

26 January 2020

To Whom It May Concern:

I am writing in recommendation of Luke Dorrian. I have known him since Fall 2019 as a student in my Introductory Biology course (BIOL 1510).

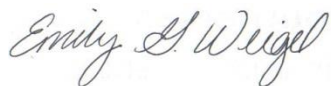
Luke is the type of student that appears to be gifted in a lot of ways, but selfishly, as an ecologist, I'm glad he's taken to questions of the environment. In my Intro Bio course, for example, it was Luke who was asking the 'big' questions on what can be done around climate change and declining global biodiversity. Besides just consulting me, he's followed up on suggestions I've made of others to consult, and he is regularly organizing with other students to address issues of sustainability on campus and globally.

Luke's interests have increasingly involved ocean sciences, and he's taken advantage of research opportunities in the Vertically Integrated Projects (VIP) program. Through VIP, he's been able to channel his programming skills for good, and he's relayed to me that he'd like to further his experiences building sensors and coding to look at bigger problems. He has yet to get experience in the field, but don't count him out: he's been scrappy in transferring to and excelling at Georgia Tech while also working his way into a position volunteering at the Georgia Aquarium, so he can make things happen when given a shot.

Luke's a quick study packaged in a polite colleague. He knows how to function on his own and when to reach out, making him an ideal student with which to work. I strongly believe he and his research team will form a collaborative, mutually-beneficial working relationship, so please strongly consider adding him to your team.

If you have any further questions, please do not hesitate to contact me; I will be happy to further advocate for him.

Sincerely,



Emily G. Weigel, PhD

Academic Professional (Teaching Faculty and Advisor)

Georgia Tech School of Biological Sciences
310 Ferst Drive
Atlanta, GA 30332
phone 404 385 1713
email emily.weigel@biosci.gatech.edu

Feb 20, 2019

Subject: Reference letter to support Mr. Luke Dorrian

To whom it may concern,

It is with my great pleasure that I write this letter to support Mr. Luke Dorrian for his application to the Summer Program at MBARI.

Luke worked as an undergraduate researcher in my lab through the Vertically Integrated Program at Georgia Tech since August 2019. In the past six months, I am extremely impressed by his dedication and passion for learning new things and his ability to apply what he learned to solve the research problems.

He is so far one of the best undergraduate researchers I have worked with in the past five years, in terms of being eager to learn, highly curious, highly committed, and very proactive. Most undergraduate researchers I have mentored are thinking of 'tell me what to do, where's the answer, etc.' But Luke was very much like a grad student in the lab, always thinks of what skills/knowledge he needs to master and are there superior alternative methods to solve this. Last semester, Luke was assigned to build a scratching test, which is considered as the most information-rich test to understand the mechanical properties of rocks and the heterogeneity in the mineralogy of the tested sample. He studied how does each of the sensors (i.e., thermocouple, LVDT, step motor, etc.) work, self-taught the Arduino control system and the LabView, and finally assembled the testing and sensor system that was fully controlled and recorded through the Arduino and the LabView. He demonstrated high dedication and exceptional capability in working with sensors, coding, and learning new things.

I believe he is truly exceptional in terms of his maturity in interacting with faculty and graduate students, enthusiasm in learning new things, commitment to solving challenging problems, and a gentle and trustworthy personality. I give my highest recommendation.

Sincerely,



Sheng Dai Ph.D., Assistant Professor in Geosystems Engineering
School of Civil and Environmental Engineering
& Ocean Science and Engineering
& Earth and Atmospheric Sciences (courtesy)
Georgia Institute of Technology
Tel: 404-385-4757 Email: sheng.dai@ce.gatech.edu



Dr. Hussein R. Sayani
School of Earth and Atmospheric Sciences
311 Ferst Drive NW. Atlanta, Georgia 30332
hsayani@gatech.edu | (404) 894-9224

February 20, 2020

To Whom It May Concern,

It is with great pleasure that I recommend Luke Dorrian for the Summer Research Internship at the Monterey Bay Aquarium Research Institute. Luke recently transferred to Georgia Tech from Loyola University in Chicago and is currently enrolled in my Introduction to Oceanography class. While I've only known Luke for a short while, I've noticed many similarities between him and some of the most stellar undergraduate students I've previously worked with – students who landed the prestigious NSF Graduate Research Fellowship and are now postdoctoral researchers at NOAA and NASA. As Luke's CV and research statement will no doubt show, he is an incredibly intelligent, driven, and infinitely capable individual.

Georgia Tech's undergraduate program is rigorous, unforgiving, and from personal experience, quite difficult to transfer into. Luke has not only managed this transfer seamlessly, he is positively thriving. He shows up to class each morning fully-prepared, eager to learn, and often asks thought-provoking questions that lead to some of the more fun and insightful class discussions. He is effortlessly maintaining a 4.0 GPA, which is no small feat here at Georgia Tech, while also working as a teaching assistant for our introduction to MATLAB course, an honor typically reserved for graduate students and our best undergraduates.

Beyond his academic achievements, Luke is currently involved in two different undergraduate research endeavors and is a volunteer at the Georgia Aquarium. As soon as he arrived at Georgia Tech, Luke began working with Dr. Sheng Dai's Subsurface Processes research group at the School of Civil and Environmental Engineering. Working mostly independently, he taught himself how to code on two different programming platforms, and helped develop a new sensor that will be used to assess the viability of geothermal power generation across the country. While discussing his work with Dr. Dai, Luke talked about learning how to break up his project into smaller, more manageable goals and setting appropriate timelines. This, more so than anything else, really stood out to me. Luke is still new to research, and he's already figured out effective time management, a hallmark trait of some of the best and most successful scientists I know. It comes as no surprise that in the few months Luke has been at Georgia Tech, he's already accomplished more than many undergraduates will in their time here.

Luke is one of those truly rare and gifted students, who given the right tools and mentorship, will undoubtedly accomplish some amazing things. Until recently, Luke has had few opportunities to engage in world-class oceanographic research. A research internship at MBARI would provide Luke with an unparalleled opportunity to work with and learn from some of the best and brightest in our field. More importantly, his impressive track record highlights that he would be an invaluable asset to any research group at MBARI this summer.

Sincerely,

A handwritten signature in cursive script, appearing to read "H. Sayani".

Dr. Hussein R. Sayani