Jazmin A. Lagier

Personal Statement

It is tempting to attribute my commitment to the biomedical field to a lifelong dream of eradicating worldly diseases or a wholesome volunteering experience. However, my real turning point came while mindlessly scrolling through Facebook, waiting for my Candy Crush lives to refill. As I searched for a way to pass the time quickly, I stumbled upon an unexpected video that a friend had shared, urging her network to watch. It was eleven minutes and fifty seconds of undercover animal vivisections, exposing me for the first time to the use of animals as research models. At just twelve years old, those scenes were shocking enough to catalyze my transition from being a kid who truly loved animals to a kid with a purpose. From that day onward, I knew my life's objective was to develop comparable or superior alternatives to animal testing models, which, years later, made me the biomedical engineer I am today.

My hands-on experience in the field began during my Bachelor of Science in Biomedical Engineering at Florida International University, where I collaborated with two distinguished laboratories. The first was the Bio-MEMS & Microsystems Group, an interdisciplinary collaboration between the Biomedical and Electrical Engineering departments. Under the guidance of Dr. Shekhar Bhansali and Dr. Vivek Kamat, I designed and fabricated a model to simulate the complex physiological environment of the human epidermis and study wound healing biomarkers. The project involved the entire process, from design and fabrication to experimentation, utilizing an engineered microfluidic device. SolidWorks was employed to design the 3D model of the device, while COMSOL Multiphysics was used for simulations to ensure optimal physicochemical conditions. We used soft lithography and PDMS for fabrication, creating both the platform and scaffolds for cell attachment. Additionally, we integrated electrical sensors for biomarker analysis, and a syringe pump was employed to administer media to the cell co-culture, which consisted of keratinocytes and fibroblasts. This project earned first place in the University's annual poster competition, which showcased projects from the entire biomedical engineering graduating cohort.

While establishing my foundation in systems modeling, I simultaneously delved into molecular modeling in Dr. Anthony McGoron's Biomaterials and Nanotechnology lab in the Department of

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Biomedical Engineering. My work focused on developing targeted image-guided drug-delivery techniques, explicitly exploring how various nanoparticle diffusion rates affected drug delivery efficacy. This research integrated wet lab experiments, imaging, and computational analysis. Nanoparticles were embedded in hydrogel mediums and tracked via fluorescence imaging from insertion to the medium's end. I used MATLAB to process the images, facilitating the evaluation of fluorescence exposure for estimating the nanoparticles' diffusion rate. Simultaneously, I furthered my understanding of the subject as I excelled in Dr. McGoron's Molecular Engineering course, achieving the highest grade in the class.

My aspiration to further my knowledge of predictive modeling led me to pursue a Master of Biomedical Engineering at Cornell University, choosing a program that emphasized medical gap identification, product innovation, and creative thinking. While collaborating with the Lee Lab at Cornell's Meinig School of Biomedical Engineering, I focused on advancing microphysiological systems. Initially, I aimed to create a villi-lymphatic model to study system interactions in a controlled setting. However, I soon realized that traditional fabrication methods, like soft lithography and PDMS, were time-consuming and hindered progress due to manual labor and disjointed processes. Consequently, I broadened my approach to replicate the complex system's biological and physical components and innovate in the fabrication process. This integration involved computer-aided design, additive manufacturing, and biocompatible materials. I created 3D models using AutoCAD sent directly to the 3D printer, which used materials compatible with the printer and the intended biological components. This shift from traditional methods to computer-aided design and 3D printing expedited fabrication, ensuring the timely completion of my initial project and laying a foundation for precise, efficient fabrication in future lab projects.

As I understood the complexities of alternative model development, my motivations evolved. What started as a broad ethical goal shifted to a focused commitment to contribute significantly to the field. With a clear objective and path ahead, pursuing a Ph.D. is my next step, and I am choosing Columbia University for the following three reasons.
Firstly, Columbia University houses an exceptional faculty, particularly in my desired field. I'm deeply interested in the pioneering work of Dr. Gordana Vunjak-Novakovic and Dr. Samuel Sia, who advance

microphysiological systems for therapeutics and disease study, aligning closely with my background. Additionally, I'm interested in the research conducted by Dr. Kam Leong and Dr. Raju Tomer, who specialize in using microphysiological models and imaging to study neurological diseases, an area I'm passionate about. Moreover, I want to integrate predictive modeling with computational tools, which aligns with my interest in Dr. Elham Azizi's interdisciplinary approach, applying machine learning to genomics for biological system study.

Secondly, Columbia University's biomedical faculty's entrepreneurial engagement significantly adds to the program's appeal. This entrepreneurial spirit resonates with my passion for innovation, which I cultivated throughout my degrees. I actively participated in Florida International University's startup ecosystem, representing my school in global entrepreneurship competitions like the Hult Prize. I worked as an engineering intern at Cornell University in a startup that innovated in ultrasonic imaging devices for medical applications.

Lastly, I value Columbia's commitment to accessible education, as it introduced me to this program. A few years ago, my interest in Tissue Engineering led me to a webinar presented by Dr. Michael Shuler, a pioneer in organ-on-chips. Remarkably, this event was part of Dr. Gordana Vunjak-Novakovic's 'Tissue Talk' seminar series, providing learning material to an audience regardless of affiliation with the University. This initiative holds profound significance for me because, while I have always had access to education, I know that not everyone does, like the women in my family.

Growing up, countless times I witnessed the sadness in my grandma's and mother's faces as they shared their experiences of being denied the pursuit of education. My grandma fled post-war Italy for Argentina and had to start working as a tailor right after middle school because schooling was only for 'boys.' Due to similar societal norms, my mother was married at 17, and her studies stopped at high school. The mere thought of me facing a similar fate was my mother's nightmare, so I've witnessed her working resiliently as a single mother to send me to the best schools and a country with better opportunities. She always said that her proudest joy was paving the path so that I could fully follow my dreams, unlike her and her mother. Today, my dream is to make a significant contribution to the biomedical field, and the possibility of doing so alongside the distinguished community at Columbia University would be another dream come true. Thank you for your consideration.