

# Trainees in the Spotlight

## Joshua Mayourian Rising to the Challenge

Pam Goldberg-Smith

**B**udding physician–scientist, Joshua Mayourian, embraces the challenges that arise along his journey. Josh graduated from Cooper Union for the Advancement of Science and Art with a 4-year combined BE/ME in chemical engineering. He is currently working toward his MD and PhD in biomedical sciences at Icahn School of Medicine at Mount Sinai. When defending his thesis work as a graduate student in the Costa Lab, he helped discover the role of exosomes as paracrine mediators of stem cell effects on heart tissue beating strength.<sup>1,2</sup> Josh's recent awards include 2 first-author manuscripts<sup>1,2</sup> selected as *Circulation Research* Editors' Picks, a National Institutes of Health National Heart, Lung, and Blood Institute F30 fellowship, and the 2018 Mount Sinai Arthur Cederbaum Mentoring by a Graduate Student Award.

### Tell Us About Your Background

As a first-generation American, I was born and raised in Long Island, New York. I learned Hebrew from my mother, who moved here from Israel, and Persian from my father, who left Iran prior to political instability in the 1970s. I am the oldest of three: my younger sister also attends Cooper Union, and my younger brother is in high school. As children, we would go to Israel during the summer to visit my mom's family. I always enjoyed math and physics in school, and my parents encouraged me to go in that direction—my dad has a PhD in mechanical engineering, and mom is a special education teacher who likes math as well.

### What Led You to Study Cardiovascular Science?

In high school, I knew I wanted to apply math and physics to a different field, such as medicine. During freshman year at Cooper Union, I became passionate about a project where I applied engineering to medicine. As a rising sophomore, I interned at Elmhurst Hospital in the Orthopedics Department through a connection with one of my professors. That following academic year, I was better exposed to chemical engineering and how it could be applied to heart electrophysiology and mechanics. I hoped to do research in this field, and, as a rising junior, I was selected to be a Summer Undergraduate Research Fellow at Mount Sinai in the Costa cardiac tissue engineering lab. During

that summer experience, I fell in love with the cardiac research project, the lab, and the idea of a dual-degree training program.

### What Can You Say About Your Current Project, and What Interests You About It?

My current project builds on the work I did as a Summer Undergraduate Research Fellow. The project utilizes human engineered cardiac tissues<sup>1–3</sup> and mathematical models<sup>1,2,4</sup> to bet-

ter understand how human mesenchymal stem cells increase cardiac contractility (or how strong the heart beats). First, we found that human mesenchymal stem cells increase contractile function in human engineered cardiac tissues through paracrine mechanisms; next, we found that the exosomal fraction of the human mesenchymal stem cell secretome is largely responsible for these effects and that microRNA-21-5p exosomal cargo plays a key role in these effects. I am largely interested in the translational potential of our findings, specifically in the context of stem cell therapies for heart disease. While the stem cell therapy field is showing great promise, there is still much work to be done to optimize this therapeutic approach to maximize safety and efficacy for patients.



Joshua Mayourian

### What Have Been Your Main Challenges, and How Did You Overcome Them?

One main challenge was transitioning from chemical engineering as an undergraduate to medicine and biomedical sciences in graduate school. While I truly appreciated my engineering training, I felt behind when I first started medical school due to my limited biology background, which required some adjustment. This past semester, I also had to balance several exciting and meaningful moments of my life, including second year of medical school, wrapping up my PhD experiments, dissertation, and defense, and to top it all off, organizing my proposal to my now-fiancée overseas in Israel during winter break. To overcome them, I have the mentality of enjoying a good challenge, making the best of the situation, feeling fortunate for what I have been given, and of course lots of caffeine. Balancing these exciting commitments was my own choice, so I knew I could handle it. Even during college, I was not looking to waste any time, and I would find a way to balance things as a scholar-athlete.

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My basketball coach would often push us to be the best versions of ourselves, have confidence, and to always look ahead. With so many commitments, it was also key to have excellent mentors (Drs Kevin Costa and Roger Hajjar), complementary lab partners and collaborators (Drs Irene Turnbull and Delaine Ceholski), and an understanding family to help me through it all.

### What Has Been the Most Exciting Moment in Your Career?

One exciting moment was my thesis defense this past winter. It was exciting to present the final product of my work to my thesis committee, collaborators, lab members, and colleagues, as well as my parents, siblings, fiancée, and her family. Having these meaningful people in my life—both professionally and personally—all together in one room and celebrating afterward was quite special. Another very exciting moment was the acceptance of my first *Circulation Research* paper.<sup>1</sup> I clearly remember being in the middle of an experiment when we received the acceptance e-mail. Many team members put a lot of effort in this project that started when I was a Summer Undergraduate Research Fellow in the lab, so it was nice to receive recognition for it.

### How Hard Do You Work?

I would say it is more fun than hard work, but admittedly, it is very time consuming. Depending on the deadlines coming up, I am either in the lab or studying for medical school for a majority of the day. Even at home, I am thinking about what I can do better in the lab, planning experiments, writing, or coding. I try to get as much done as possible late at night so that I can eat dinner and spend time with my fiancée.

### How Else Do You Spend Your Time Outside of the Lab?

I continue to play basketball—it is a passion that helps me clear my mind, have fun, and compete. After I graduated from Cooper Union, I stayed as a part-time assistant coach for the team for a few years. My fiancée and I often visit our families in Long Island, and we spend time with our siblings and her nieces and nephew. Otherwise, my fiancée and I like to relax at home or explore New York City. There is always so much to do, whether it is walking or biking in Central Park, going to restaurants, or improvisational comedy shows in the East Village.

### What Worries You Most About Your Future and Pursuing an Academic Career?

On top of the common answer of lack of funding, I am most worried about maintaining a healthy work–life balance. With limited positions open for tenure, there is a lot of pressure to put in as many hours as possible to be as productive as possible. While I truly love what I am doing and have a very understanding fiancée, I want to be fair to myself and to her.

### What Would You Do to Improve Training in Research?

High-throughput sequencing and mathematical simulations are commonly incorporated into research today to complement experimental work and generate new hypotheses. To

improve training in research, I would, therefore, incorporate courses in these fields into the core curriculum, which may lead to even more successful collaborations between wet and dry lab collaborators. Also, I would add more flexibility to the MD/PhD training to allow students to start their PhD after the first or third year of medical school. I was given a chance to start my PhD after the first year of medical school; I truly am happy with the decision, and several more senior classmates say they wish they had the opportunity to do the same.

### What Do You Like and Dislike About Research?

I like the daily routine: working in a team, problem solving, spending time with my mentor and lab mates, and even writing papers and grants to get my ideas out. Dr Costa creates a fun, exciting, and enjoyable workplace, so I am lucky to have him as a mentor. He is a great role model on how to run a lab and keep a positive energy in the lab. He also understands the need for a work–life balance and my priorities as a future physician–scientist. In addition, Dr Roger Hajjar has created a collaborative environment in the Cardiovascular Research Center, which makes it easy to work in a team and utilize several people's strengths. A good environment is key to enjoying the work. I dislike the pressure associated with obtaining extramural funding and tenure promotions.

### What Traits Do You Consider Important for Success in Research?

Be persistent and keep going after what you want. You must be resilient, as there are a lot of ups and downs with research that you must push through. It is important to be receptive to feedback as a student and to listen to your mentor and other advisors (eg, thesis committee) to get the most out of training. For me specifically, I felt like working in a team, and collaborating was key to success in my projects. Pairing my background in computational biology and cardiac tissue engineering with others more skilled in molecular biology led to higher productivity and also made it more fun!

### Disclosures

None.

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