

PEOPLE & IDEAS

Efraín E. Rivera-Serrano: Personal training for scientists

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Rivera-Serrano investigates the host cell genes that support viral infection.

Breeding farm animals to support his family while growing up on the southern coast of Puerto Rico coincided with Efraín (Efra) E. Rivera-Serrano learning about the principles of cell division and inheritance in school. Rivera-Serrano became obsessed with understanding how these cell biological processes could be applied to animal husbandry. Rivera-Serrano credits the splendor of the natural environment of Puerto Rico for fueling his passion for science but his Mom for sacrificing her own education to earn money to feed her family and ensure Rivera-Serrano's own professional success. The first of his family to attend college, Rivera-Serrano considers curiosity and intellectual freedom the most critical factors when considering a profession. Still obsessed with cell biological processes, Rivera-Serrano now sports a tattoo of each stage of mitosis on his arm but has swapped the farm animals for cells such as cardiomyocytes and investigates how they can be invaded by viruses.

We contacted Rivera-Serrano to learn more about the twist and turns of his scientific journey so far.

What have been the biggest challenges you've faced so far in your research career and how did you overcome these obstacles?

I moved to the United States' mainland to start graduate school immediately after graduating from college back in Puerto Rico. I initially started my PhD training at North Carolina State University (NCSU) in plant biology studying intracellular protein trafficking in root cells but decided to leave that trajectory. I left with a Masters' degree a few years later due to several issues, mainly dealing with racism and discrimination that

eventually led to the deterioration of my mental health. My passion for research, however, remained intact and I was lucky enough to be given the opportunity to restart my doctoral training in the same institution but in a completely different field: animal virology. I spent a little over four years training with Dr. Barbara Sherry at NCSU studying how different cardiac cells respond to viral infections and ultimately orchestrate immune responses that dictate the outcome of disease in the heart (1-3).

"Sometimes it is okay to simply let life take control"

What are you currently working on and what is up next for you?

Despite my initial lack of interest in viruses, I have always been fascinated by cells, and the notion of cells sensing microbes and alerting the body of their presence continues to mesmerize me. Thus, I moved on to the University of North Carolina at Chapel Hill for a two-year postdoctoral fellowship to continue my virology training under the guidance of Dr. Stanley Lemon. My work there focused on understanding the mechanisms that hepatitis A virus uses to enter and egress from hepatocytes (4), as well as identifying cellular factors that regulate viral replication. Currently, I am finishing my last month as a postdoctoral scholar at the University of California, Davis, where I have been developing platforms for the identification of genes important for replication of RNA viruses through CRISPR technology. Facing the difficulties of leaving and returning to graduate school has been life-changing, but they brought me to where I am now and have shaped the person I am today. I was fortunate enough to have the



Headshot taken in California by Blanca Serrano Mendoza (Rivera-Serrano's mom) in 2019.

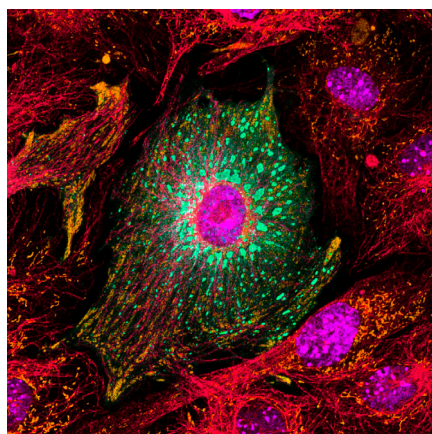
support of friends and colleagues who helped me succeed and every day I strive to help others with their struggles. We cannot do this on our own. What will happen next in my career? I do not know. But I do know that sometimes it is okay to simply let life take control. Same way as life (and serendipity) brought me to the field of host-microbe interactions, I believe it will continue to reroute me in the best direction possible.

What do you see as the main benefits of scientists using social media and do you have advice for scientists looking to engage their own communities or further afield?

Aside from the obvious benefits of closing the communication gap between and within

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Confocal micrograph of a culture of cardiac fibroblasts infected with reovirus showing nuclei (purple), microtubules (magenta), mitochondria (yellow), and viral replication factories (green). Image courtesy of Efraín E. Rivera-Serrano.

scientists and nonscientists, I believe that putting a human face next to their scientific research is the biggest benefit from our presence on social media. Almost everyone, including many scientists, continue to (erroneously) imagine that scientists look and behave a certain way. Not surprisingly, we all have a life outside our profession filled with interpersonal relationships, passions, dreams, and a journey that makes us unique . . . we are human, too. I encourage every scientist to join the large community of scientists that interacts every day on social media. Using Twitter has provided me with so much—friends, support, visibility, jobs, and even the opportunity to be featured here in *JCB*. But, surprisingly, it is not as easy as one may think. Developing a solid presence on social media as a scientist is not trivial; you are constantly trying to get thousands of people to enjoy your content enough to follow your posts almost daily and to remember you for it. I recently wrote a blog for *PLOS SciComm* (5) with tips for scientists to keep in mind if their mission is to communicate science through social media. It really is not that much different from writing a scientific manuscript or a grant: you must have a strong message and convince your audience that what you have to say is important enough for them to care. However, we are science professionals and we as a community will be judged according

to our actions and presence on social media. It is important to remember that we will always represent science as a whole to the average reader.

“Science is a discipline that relies on human interactions and these can strongly influence the outcome of how a trainee (and even a tenured professor) perceives science as a whole.”

You reveal quite a lot about your personal life on Twitter. Have there been both pros and cons in doing this as a scientist?

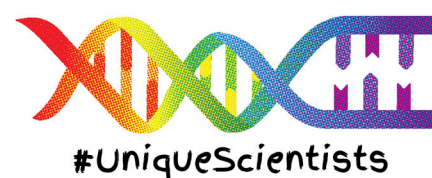
I use Twitter daily as a platform to communicate biology with the world, but also to advocate for other factors that current research training practices often ignore. I had to quit my PhD the first time based solely on interpersonal relationships that had nothing to do with my intellect or abilities as a scientist. Science is a discipline that relies on human interactions and these can strongly influence the outcome of how a trainee (and even a tenured professor) perceives science as a whole. As a scientist, I value transparency and I believe that sharing some of my personal experiences and efforts in promoting work-life balance and self-worth helps others identify their own voids and teaches them how to succeed. As for everything we do, there are always risks. Some folks may disagree with sharing personal information on social media, but I see it as an opportunity to demonstrate that scientists have a lot in common but that we are also unique. In the end, the benefits of having a strong presence on social media outweigh those of not having one. I have received invitations to give seminars on this topic, interviews, and scientific discussions, and I have made friends all over the world. Realistically, even with a strong publication record, almost no one would know who I was if I did not take the time to show them.

What inspired you to set up the Unique Scientists initiative and what are its main goals?

I have been subjected to discrimination and biases from both scientists and nonscientists

ever since I moved to the USA. These issues were the determining factors when I decided to quit my PhD training. Unfortunately, not much has changed when it comes to human biases and perceptions of how scientists should look. With this in mind, I wanted to create a platform where we highlight the individual journeys of scientists from all over the world; a platform where scientists are more than just scientists. I founded Unique Scientists (<https://uniquescientists.com/>) with the mission of embracing diversity in STEM and to contribute to a welcoming atmosphere that promotes an appreciation for self-identity in science. My dream is for everyone to see that your physical appearance, disabilities, gender and sexual identity, race, religion, lifestyle preferences, and other subjective variables should never be a determining factor in the career you choose. How this works is fairly simple: the scientist answers seven questions, provides a few personal pictures, and we package them as spotlight stories that we share every other day on our website and on social media. We have received excellent feedback from the community thus far and could not be happier with the support we have encountered. Undoubtedly, I will continue to use visibility as a tool to change minds, and my battle to defend equal rights will never end.

1. Rivera-Serrano, E.E., et al. 2017. *J. Mol. Cell. Cardiol.* <https://doi.org/10.1016/j.jmcc.2017.08.008>
2. Rivera-Serrano, E.E., et al. 2017. *J. Virol.* <https://doi.org/10.1128/JVI.02488-16>
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4. Rivera-Serrano, E.E., et al. 2019. *eLife.* <https://doi.org/10.7554/eLife.43983>
5. Rivera-Serrano, E.E. 2019. <https://blogs.plos.org/blog/2019/05/23/hashtag-sci-comm-how-social-media-platforms-are-shaping-the-future-of-science/>



One of the Unique Scientists logos.