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INTERVIEW

An Interview with Mansi Srivastava

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Mansi Srivastava is a John L. Loeb Associate Professor of the Natural Sciences at Harvard University. This year, she was awarded the Elizabeth D. Hay New Investigator Award by the Society of Developmental Biology, which recognizes new group leaders who have performed outstanding research in developmental biology during the early stages of their independent career. Mansi's research focusses on investigating wound response and stem cell biology during regeneration in an evolutionary context. We talked to Mansi to discover how she feels about receiving this award, and about her career and her activities outside of the lab.

This year you were awarded the Elizabeth D. Hay New Investigator Award by the Society of Developmental Biology. What does this award mean to you?

I feel extremely honored to receive this award. The award process involves a nomination by peers or colleagues in my field, and the fact that people in my field got together and put in time and effort to put my name forward means a lot. It feels truly special to know that people in my research community value the work I have done, and to be recognized by a society that is my 'home' society is all the more meaningful. Moreover, Elizabeth Hay used to study regeneration when she was faculty at Harvard Medical School. It feels great to have this connection to the person after whom the award was named.

Circling back to earlier in your life: when did you first become interested in science, and when did you decide to pursue a scientific career?

I was always very interested in biology, for as long as I can remember. My mother was a biology schoolteacher, which meant that I was always surrounded by biology talk. My best friend's mother was a botany professor, who taught me Mendelian genetics when I was 10 years old, using dried out peas and beans from jars in her kitchen. At the time that I was growing up in India, the only feasible career option for someone interested in biology was to become a medical doctor. I knew that I did not want to do that, and that I was more interested in research. Therefore, I decided to come to the USA for college, where undergraduate research was highly valued.

What was it like coming from India to the USA?

It was thrilling. I left India when I was 18, right after I graduated from high school, to go to a small liberal arts college in Massachusetts called Mount Holyoke, which was a wonderful environment. The value of a liberal arts education is that you study things broadly, and really push intellectually on what your interests are. I focused a lot on thinking about important questions and reading a lot of old literature, which I think set me up well for working on biological problems in the longer term.

You did your PhD with Daniel Rokhsar at UC Berkeley – what motivated your decision to join his lab?

As an undergrad, I often found myself drawn to understudied animal lineages. For example, my undergraduate thesis research was focused on a group of segmented worms. When I went to graduate school at Berkeley, I rotated in a few different labs, and learned that Daniel Rokhsar had just started his appointment in Molecular and Cell Biology. Daniel's group was interested in using genomics to investigate poorly studied animals whose phyla diverged early in animal evolution, such as sponges, cnidarians, which include jellyfish and sea anemones, and also a placozoan called *Trichoplax*, which I ended up working on a fair bit. Overall, I was drawn to his lab because of the opportunity to study the biology of understudied groups because I felt that this held promise to discover new things.

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In your first paper, you sequenced and analyzed the genome of the placozoan *Trichoplax*. How did this project come about?

I started graduate school at a time when some of the first few genomes, such as the human, fruit fly, yeast and nematode genomes, had just been published. The big genome sequencing centers that had been established to sequence the human genome were now sitting empty and open for new organisms and questions. Daniel is a director at one of these, the Joint Genome Institute, where they held a meeting allowing biologists to pitch their organism as a candidate for sequencing. This is where the idea of using genomics to understand early animal evolution came about. In the end, many genomes were slotted for sequencing, including *Trichoplax*, which is a species that belongs to one of the most enigmatic animal phyla. From the top, they look like an amorphous amoeba, but unlike amoebae, which are single celled, they are multicellular entities and bona fide animals. People often think of *Trichoplax* as a simple animal that lacks biological complexity. Although there were not a lot of tools to study this organism in the lab back then, we could easily sequence its genome, which revealed some big surprises, namely that it contains a good number of the different types of genes that make our seemingly very complex bodies.

After your PhD, you did a postdoc with Peter Reddien at the Whitehead Institute to establish *Hofstenia miamia* as a model system for studying regeneration. What led you to join his lab and take on this project?

In my PhD, I had ended up focusing heavily on computational approaches, so for my postdoc, I wanted to go back to my original love of the problem of regeneration, and combine my computational skills with experimental research to study regeneration from the lens of evolution. Peter Reddien's lab had become one of the leaders in studying the process of regeneration using planarian worms as a model system. They had developed many of the frameworks to conduct mechanistic studies of regeneration, asking which genes and cell types are involved. I came to Peter's lab to use those approaches to study other organisms, because you have to take a comparative approach to learn about evolution. I joined an existing project in the lab to learn how to perform mechanistic studies in planarians, but also started playing around with lots of different species that previously were not amenable to laboratory research. After going through a series of different systems, I arrived at the worm *Hofstenia miamia*, which is an acoel that superficially might look like a planarian, but evolutionarily is very distantly related.

You have to take a comparative approach to learn about evolution

Do you know where your fascination for unusual model systems comes from?

I think I am attracted to what is different and obscure. This love probably comes from my experiences in a small liberal arts college, where I had access to tons of old literature, but not to a lot of cutting-edge research. The old literature revealed that biologists used to study the biological world broadly, investigating many more species than we do now. It also revealed to me that many questions can only be answered by studying different kinds of organisms, and I was drawn to the beauty of diverse animal life.

What was the transition to becoming a group leader like for you?

It was definitely a transition that came with many rewards and challenges. Midway through my postdoctoral research, I felt like I had many more ideas and questions that I wanted to answer, but I could not physically actually accomplish all of that on my own. Starting a lab gives you the opportunity to realize the vision you have for the many questions you want to study, so I felt ready to lead my own group. It has been super rewarding to find that my trainees not only help me address the questions that I had when I started my lab, they also help me see things differently and they get me excited about new questions that I had not even thought of. I still remember the first lab meeting where a trainee presented a great deal of work and the other lab members just dug into it, giving feedback, thinking hard and trying to solve these intellectual problems. That moment felt really rewarding.

Starting a lab gives you the opportunity to realize the vision you have for the many questions you want to study

Has there been anything challenging about the transition period?

The challenge, which still continues to this day, is the sheer number of things I have to do. In addition to managing the research efforts of the lab, which includes training, advising and grant writing, I teach undergraduate and graduate students, serve on many departmental, PhD and University committees, and engage more broadly in the scientific community by reviewing and editing papers, participating in societies and organizing conferences. Although it is rewarding to do all of these things and to witness the science of other young scientists, the sheer number of tasks can sometimes be quite something to contend with.

It has now been over five years since you became a PI. What would you say are the most important things that you have learned about being group leader since you started?

A big point of learning for me has been to articulate my expectations clearly. I have a lot of idealism about science and sometimes it is easy to think that if smart people went into a lab and start doing science, everything would just flow beautifully. What I've learned is that things go better and more smoothly when I do my due diligence in setting up clear expectations, communicating myself more effectively and helping to facilitate better communication among people in the lab.

Can you summarize the current research themes of your group?

One of the questions that excites me most is thinking about the evolution of regeneration, particularly the kind of exciting regeneration we see in many invertebrate species, where you can separate an animal into many pieces, and each piece then makes a fully functioning organism with a whole new brain and fully restored function. We see this across many distantly-related animal lineages. The question that emerges is whether there is one way to accomplish this regeneration, which would suggest that perhaps there was a common ancestral regenerative property that was inherited by extant animals. Alternatively, there may be many different ways, at genetic, molecular and cellular levels, of accomplishing regeneration, which would indicate that regeneration

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evolved independently multiple times. A big theme in the lab is to use *Hofstenia* to dig deeper into the mechanisms of how regeneration is accomplished in this organism, with the ultimate goal of making comparative statements. *Hofstenia* is an excellent system because it offers us many tools, such as transgenic animals, and it gives us access to studying development in embryos. This becomes really important in addressing a classical question in regeneration biology, which is how regeneration relates to developmental biology. All animals start out as embryos and make all of their adult structures, but not all animals can redo or re-accomplish that as adults during regeneration. Figuring out how these regenerative organisms can still call upon those developmental processes has been important to the field for a long time. Because *Hofstenia* allows us to study both regeneration and development, this question has also become a major theme of research in our lab, in addition to thinking about the evolution of regeneration.

How did you navigate the fields to find your own niche within it?

I think my niche is at the intersection of two different fields. Much of my training was in the field of evolutionary developmental biology, or evo-devo. Many people out there have been comparing, for decades, embryonic processes between different species to make statements about how development has evolved. Then there is the field of regeneration biology, where people pick their model organism and figure out how regeneration works in that organism. My work falls at the intersection, where we take the frameworks and approaches of evo-devo and intersect that with questions in regenerative biology. We have found that connecting two seemingly distantly related fields has been a really productive place for us to do our work.

In your opinion, what are the most exciting areas in the field at the moment?

I think what is exciting is that new technologies such as high throughput sequencing of chromatin states or RNA at the single cell level, as well as techniques such as CRISPR, which allow us to do genetic perturbations, have become so broadly applicable. These kinds of techniques used to be only available for the model systems. Now it feels like you can walk into the water, pick up an organism and, in a few years, hope to have many tools working and be obtaining data from that system. This is what is truly exciting for figuring out the evolution of regeneration, because many researchers can go out and study regeneration in diverse systems at a mechanistic level. This will allow us to finally begin making robust comparisons, as opposed to superficial comments on similarity.

How important do you think mentorship is in navigating an academic career?

I think research and academia work on an apprenticeship model. It is impossible to just read a book or papers and then be able to figure out what the next big question is or to do the next most informative experiment. A research mentor provides access to training in thinking and in experimental/analytical skills. But career progression takes more than just understanding the field and knowing how to do experiments. Trainees are trying to figure out what their career goals are while they are also learning how to be good scientists. Good mentoring, I think, should help trainees see that it is ok to define your own career goals, and not just do what everyone else around you is doing. It should also encourage trainees to see that, just as there are diverse career goals, there is a diversity of paths that people take to the same end point, such as becoming a professor. My mentors gave me intellectual freedom and took me seriously from day one, which was really nice. I had the freedom to work on the questions I cared about and to figure out my professional goals as well. I try to reproduce those experiences for my trainees.

A research mentor provides access to training in thinking and in experimental/analytical skills

Outside of your research, you are currently participating in the 'Evolution as an Experimental Science' project, in partnership with the Harvard Museum of Natural History and the National Science Foundation. Can you tell us what this project is about and how you came to be a part of it?

I proposed this project as part of my grant application to the National Science Foundation (NSF). One of the cool things about the NSF is they care about broadening the impact of the research they fund. I applied for the NSF Career Award, which gives an opportunity to have an in depth education plan, where you can propose meaningful approaches to make your work accessible to the public at large and also to broaden access to underrepresented groups in science. I realized that my school teachers played an important role in getting me excited about science. Another thing I had the privilege to do in high school was to have hands-on experience with the material we were reading about in our books. Therefore, the goal for my NSF project was to provide hands-on experience with evolutionary biology, a type of biology that often students perceive as 'theoretical'. I proposed to use a train-the-trainer model because I felt that the most meaningful way to provide hands-on experience was to first train the teachers. In collaboration with the Harvard Museum of Natural History, we host school teachers for a 3-day workshop where they extract DNA from organisms one can buy at a grocery store, ranging from spinach to calamari to chicken. Participants then amplify a ribosomal gene and obtain its sequence, and use their own data to build a phylogenetic tree to see how, for example, spinach, mushroom and shrimp are related to each other. As part of this program, graduate students volunteer to go into classrooms to help teachers bring these experiments to their students. The students love getting to handle things like pipettes and to run gels, but I think that the most meaningful thing is to see our graduate students and get a sense for what real, young scientists are like.

You are also the editor-in-chief for the journal EvoDevo. How did this come about, and what is your experience of the publishing industry from the 'other side'?

This is one of the aspects of my professional life that I really enjoy. EvoDevo is an Open Access journal that started in 2008. After the first two editors-in-chief, Max Telford and Mark Martindale, had served for 10 years, they wanted to move on and bring in fresh blood, so to speak. I was asked by the journal if I would consider doing this. This was very exciting because it gives me an opportunity to experience science in my field that is broader than the specific area that I work in. For me, it is an awesome experience to receive a paper on a topic that I do not really know much about and then to do a deep dive into why this question is important and who the relevant people are in this field, so that I can find appropriate and fair reviewers. It has also given me an opportunity to think deeply about publishing practices, including what makes for a fair review process, which has been extremely

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rewarding. I am co-editor-in-chief with Andy Hejnol and we get to have conversations about broader directions for the journal. For example, we have noticed that plant biology has a big place in evo-devo, but often it is not as prominent in journals or at conferences, which tend to have a strong animal focus. Therefore, in consultation with members of our editorial board, who are plant evo-devo biologists, we have now launched a special issue of the journal that focuses on highlighting work in the plant evo-devo world.

Last year, you also joined the advisory board of the International Society for Regenerative Biology. Why did you take on this role and what is actually involved in it?

This effort was launched by leaders in the field of regeneration biology, including Ken Poss and Elly Tanaka, who wrote an Editorial that was published in Development, explaining the motivations for the society (Poss and Tanaka, 2021). They saw a need for this society because the field has grown. Many people study development, and regeneration is a type of developmental biology, but there really are enough of us now that we need a forum to be able to share work with each other, a nexus that focuses the attention of many people working on diverse regenerative organismal systems. This will help us make inferences about what the general principles of regeneration biology are, if there are any. I helped organize the inaugural meeting this past April, the goal of which was to showcase the diversity and depth of the research that is going on in regeneration biology right now. Now, we are really excited about our upcoming meetings.

Did you ever consider a non-academic career path?

In graduate school at Berkeley, there was acceptance of the fact that people have different reasons for doing PhDs and different goals. Students had opportunities to do internships in the tech world, for example. The career path I considered most seriously back then was consulting, because what I found attractive was the possibility of being able to use my mind for many different problems: you think about something really hard for six months, and then you move on and think deeply about the next thing. I did not pursue it seriously, but I definitely considered it.

Lastly, is there anything our readers would be surprised to learn about you?

This is a great opportunity for me to talk about my personal identity: I am an out lesbian woman, married, with two kids. Oddly, people seem surprised when they first learn about this, even though it is nothing I have ever tried to hide. I find that it is meaningful for young trainees to know that there are people with diverse identities in academia and other professions, and for that reason, this is something I would like to share.

Reference

Poss, K. S. and Tanaka, E. M. (2021). A new society for regenerative biologists. *Development* **148**, dev199474. doi:10.1242/dev.199474