

2021 Peter Mark Memorial Awardee: Bharat Jalan - *“For excellence and international leadership in metal-organic molecular-beam epitaxy of complex oxide heterostructures for new electronic materials”*

By Abby Rizzo

The Peter Mark Memorial Award honors a special type of scientist – one under 35 years of age, who has already made significant scientific contributions in his/her field through outstanding theoretical or experimental work. This year, AVS honors a young scientist, Dr. Bharat Jalan, University of Minnesota, with the 2021 Peter Mark Memorial Award. Bharat’s work has been recognized with numerous awards, which are listed in his [biography](#). Bharat’s work has earned him much recognition in his career, and we wanted to know more about him. So, we were pleased when he granted AVS an interview. We learned about his journey through AVS, what motivates him professionally, and some of the special people who have helped him grow personally and professionally.



Journey through AVS

Bharat has been quite active in AVS since he joined. He explained that the “Society is very close to my heart with direct relevance to my research interests. AVS also provides an excellent platform for training, education, and interaction with students. I have always said that we do research under no pressure (i.e. vacuum) and this can only happen in AVS.” Bharat first became affiliated with AVS in 2008 during his PhD work while he was learning about synthesis and vacuum science. He reminisced that it did not take long to hear about the great reputation of AVS, and said fondly, “It’s an excellent community and I have been so proud to be a part of [it].” AVS published some of his earliest papers in their journals, and Bharat enjoyed attending several AVS conferences when he first started getting to know the Society. He has continued to stay involved with AVS as one of the co-founders of the Annual [Minnesota \(MN\) AVS Symposium](#), which has been held every year since 2012. Additionally, “with the help of the materials science undergraduate students,” Bharat also established a [Minnesota \(MN\) AVS Student Chapter](#) in 2015 at the University of Minnesota. Bharat has additionally served on the advisory board for the Vacuum and Thin Film Technology program at the local Normandale Community College since 2013. He feels this important program prepares students to work as a technician in industries that rely on vacuum-based processes to manufacture products. Furthermore, he also served as a guest editor for the AVS journal [JVSTA](#) for a special topic collection on complex oxides. Finally, Bharat will also serve as Program Chair of the upcoming 36th North American Conference on Molecular Beam Epitaxy (NAMBE 2023).

Professional Life

Bharat’s work as an Associate Professor in the Department of Chemical Engineering and Materials Science at the University of Minnesota, where he leads the Quantum Materials Design and Synthesis Group, enriches his life greatly. He also serves as the Director of Graduate Studies for Materials Science and Engineering, in addition to holding a graduate faculty appointment in the School of Physics and Astronomy, and the Department of Electrical and Computer Engineering. Bharat’s research focuses on the study of structure-defect-property relationships of functional oxide films and artificially designed structures. His current focus is on perovskite-based quantum materials and their heterostructures. While Bharat enjoys conducting this innovative research, he finds the greatest joy in interacting with students. “It’s really the students who make my job worthwhile.” He expressed his enthusiasm for “the freedom of thinking of an abstract idea, then talking with students/postdocs and colleagues, and a few years later, your students/postdocs make that happen. The joy of dreaming and then bringing [ideas] to

reality is quite rewarding!” His relationship with his students is perfectly captured by the motto by which he lives, “Encouragement is scarce but criticism is abundant in our life. Believe in yourself!” Not only does this make him a great scientist, but this also makes Bharat a fantastic leader and mentor. Beyond his excellence in working with students, others know Bharat for his careful approach to addressing problems in condensed matter physics through innovation in materials.

Beneath the Surface

Bharat has big goals, and we believe he will attain them due to his philosophical ideas about achievement. His next big professional focus will be to relate quantum science to music! He explained the work of his group further, “Do you like music? Isn’t it nice when specific musical notes resonate with your brain making you feel better? I wonder if a similar resonance exists, either by tailoring phonons or electronic excitations that can help control crystal growth.” He feels that this research could significantly impact the synthesis science of quantum materials. The reason Bharat feels so comfortable exploring the unknown is due in part to his philosophy about scientific research. He tells his students that, “there is no absolute right or wrong in scientific research. It is just perspectives. If you believe in something, trust yourself regardless of what others may preach about. Do not worry about failure. Failure has a different meaning in science. It is the gateway to discovery.” He also explained another aspect that he feels leads to success by using an analogy. He asked us to consider a crystal, for instance a doped silicon, a semiconducting material that has a profound impact on our modern life. He then asked us to ponder what makes doped silicon special. He went on to say that it is the location of the dopant and its surroundings. “Phosphorus must be surrounded by silicon correctly to be doped silicon, or this doped silicon won’t be the same as that which we all care about - the surroundings matter. In the same way, our success, especially in academia, is largely decided by whom are we surrounded by, i.e. your students, collaborators, colleagues and family, even more than who you are. The strength of these connections makes each of us special.” Bharat truly feels his connections have led him to his success.

When asked who has inspired him throughout not only his career, but through his entire life, he described being grateful that he found this question difficult to answer due to there being “so many people.” This list included his teachers, his parents, his brothers and sister, his wife, his friends, and now his children. “Whether about science, or just being a good human, I owe my success to my mother.” His mother always told him that “the most important thing in life is to care for others.” He also feels grateful to his father and older brothers, who taught him that “there is nothing too difficult that we can’t achieve. All it requires is that we never be afraid of trying things that you believe in.” Finally, he also thinks that he is “lucky to have found my wife, who continues to foster this idea in my brain.” Bharat’s family is obviously important to him. His limited free time almost always involves them. He likes to spend time with his children solving puzzles, making Play-doh shapes, or playing with slime. He also enjoys going for long walks with his family, and sometimes with good friends. Bharat shared that he originally came from a small town, Raxaul, in Bihar, a northern state of India. He explained that this region of India is poor, and education is not available to many. As a result, he feels fortunate that he got an education, and this also gave him the opportunity to hang out with kids from many diverse backgrounds. “It not only gave me a lot of good friends, but also taught me great life lessons - be good to people regardless of their background. I think we all need to work hard to give back to our society, either through donations, encouraging underrepresented people in STEM, or by other means.” Clearly, Bharat’s humility and receptivity to others’ needs set him apart.

Dr. Bharat Jalan is a deserving awardee who has already made significant contributions in his field through outstanding work. We hope you will join AVS in congratulating him!