DR. ZAIN KHALPEY

Interviewed by: Alex Liu and Rohini Patel

Dr. Zain Khalpey, a surgeon scientist who translates results from the benchtop to bedside, graduated with an MD from Guys' and St. Thomas' in the UK in 1998. After completing two research fellowships, Transplant Biology at Mayo Clinic in Rochester and Massachusetts General Hospital, Dr. Khalpey pursued his general surgery residency (2005-2010) at Brigham and Women's Hospital, Harvard Medical School. He finished in 2012 at Brigham and Women's Hospital with a fellowship in cardiothoracic surgery.

Dr. Khalpey came to the University of Arizona because he saw the opportunity, talent, and substrate to create his vision. He found the topic of stem cells and regeneration compelling because immunosuppression following transplant was a dire problem for patients, resulting in mortality. He aimed to prevent post-transplant immunosuppression by creating a hybrid scenario through injection of stem cells into the patient's heart with a liquid matrix, followed by use of an artificial pump to remodel the patient's own heart while in surgery. These hearts could then recover instead of being transplanted. There are currently 12 patients with stem cells with their devices, but it is too early to determine the results. However, it is clear that the University of Arizona contains the tools, people, and environment to make this vision a reality.

Dr. Khalpey's current research entails using a 3D bio printer to print heart valves as well as to determine how long stem cells are viable, and their actions when injected into a sick heart. One of his goals is to learn how cells in the aforementioned liquid matrix interact, and how they can be manipulated to improve engraftment in patients.

Dr. Khalpey states that being a surgeon scientist *"allows you laterality in thought, to think more cautiously about possibilities."* One must "define human limits, understand the science, and wonder if you can push it." He emphasizes the importance in making sure patients are not experiments, but are involved in the bigger picture of helping others.

Without hesitation, if he could go back in time, he would still choose to become a cardiothoracic surgeon. For him, CT surgery allows for clean end points and mechanical support that can change people's lives conclusively. It is a relatively young field where molecular tools are now being used, and it is an exciting time to push new envelopes.

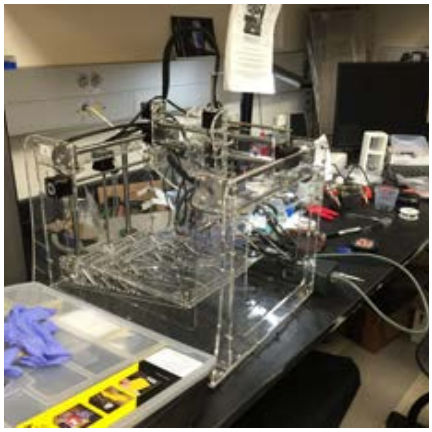
In regards to misconceptions medical students may have about surgery, Dr. Khalpey admits while there is hardship in honing skills during residency, *"If you want something, no matter how hard the path to get there, you will get it."* He affirms the notion that a great lifestyle is attainable "if you get through the conditioning process, and [being a surgeon] becomes who you are and what is important to you."

"Research is one of the foundations of education, and it is not in its own silo," he says. Mentors must allow students the "exposure and tools to think and create, and the freedom to fail safely." By obtaining the scientific data, students can assess what went wrong, figure out how to fix the problem, and go beyond.

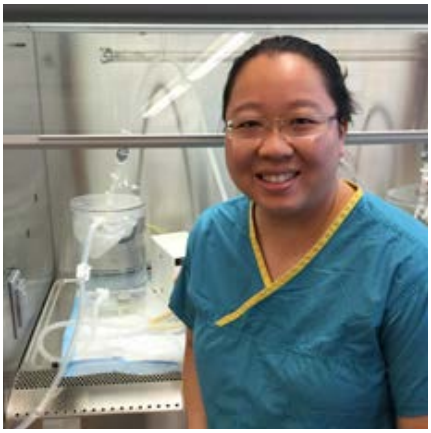
In response to what medical students should be doing in terms of research involvement, Dr. Khalpey states that *"you have to know whether research is for you or not, [and] get involved now."* However, the right environment and people are necessary; a mentor must be hands-on with lab meetings, demands, expectations, responsibility, and accountability.

There is always an open door to Dr. Khalpey's research lab, and opportunities will be tailored to what the students want.

Students may email Dr. Khalpey directly at zkhalpey@surgery.arizona.edu.



A Fab@Home Model 1 3D printer. It is an open source 3D printer project that provides instructions and parts for people to build their own 3D printers at home. Alice built that printer on her own, and with help from Divneet Mandair and Ned Premyodhin, is getting it to work.



Student Alice Ferng, PhD stands in front of a tissue decellularization pump and chamber used to decellularize pig hearts.

Several members of the lab. From left to right: Naing Bajaj, Mehreen Kisat, Destiny Dicken, David Schipper, Alice Ferng, Dr. Zain Khalpey, and Annalisa Medina.