THE UNIVERSITY OF ARIZONA College of Medicine Phoenix

SPECIALTY REPORT

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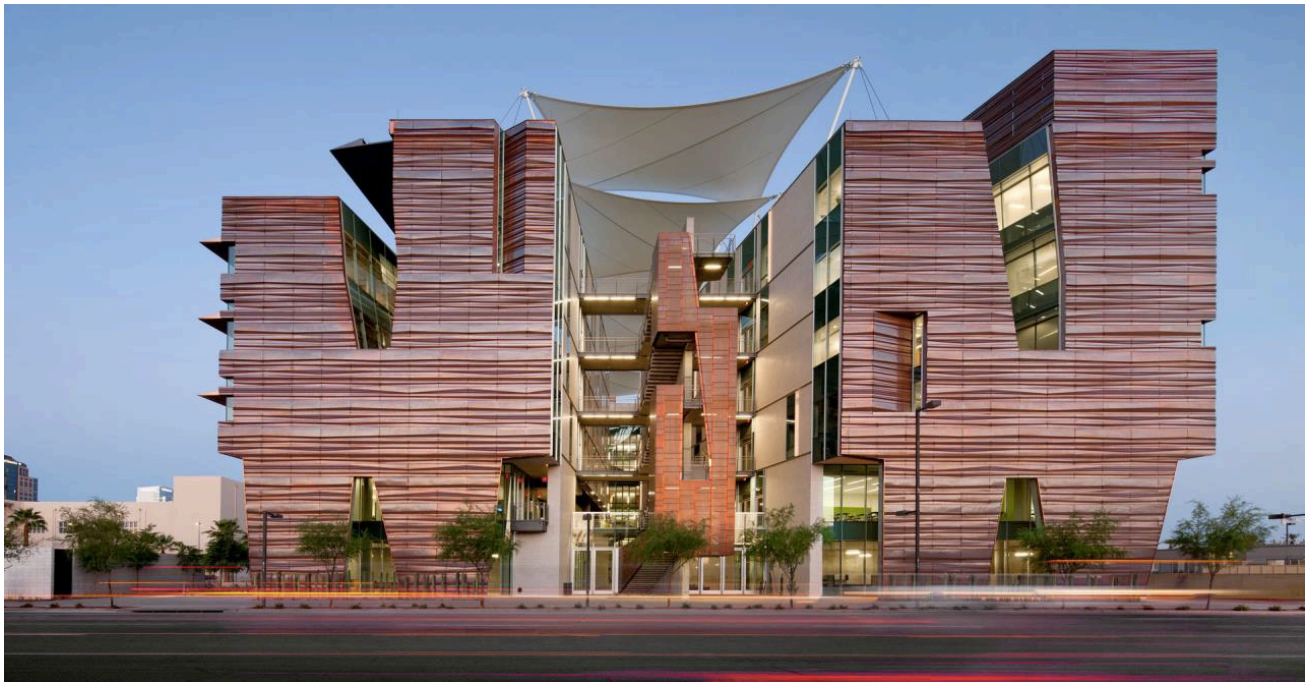

Featured Interview

X. Frank Zhao, MD, PhD, MBA

Department Chair
The University of Arizona College of Medicine – Phoenix

Dr. X. Frank Zhao is the Professor and Chair of the Department of Pathology at the University of Arizona College of Medicine - Phoenix. He graduated from Shandong Medical University, completed a Ph.D. in Biochemistry at the University of Western Ontario, completed his Pathology residency at the SUNY at Buffalo, and his Hematopathology fellowship at the University of Pennsylvania Hospital. After earning his MBA from the University of Maryland Smith School of Business, he was recruited to the University of California San Diego/San Diego VA Medical Center as the Clinical Professor/Clinical Core Lab Director in 2012, and University of Arizona College of Medicine Phoenix/Phoenix VA HealthCare System as the Clinical Professor/Chief of Pathology and Laboratory Medicine in 2016.

What drew you to the field?

Pathology is a very interesting discipline which bridges basic and clinical sciences. I was attracted to this specialty when I was still in medical school by its nature as the foundation of medicine and my curiosity in the cause of diseases. After graduation, I went on to perform research in immunology and molecular genetics. To be a better researcher, I obtained a Ph.D. in biochemistry in London, Canada and subsequently worked as a postdoctoral fellow on the genetics of pediatric leukemias at the Roswell Park Cancer Institute, the world's first cancer institute. Then, I found pathology as the best specialty that fit my career goals as a physician scientist. Owing to my research background on hematological malignancy, I decided to pursue a clinical fellowship in hematopathology so that I could continue with my research interests while still practicing as a hematopathologist.

How has your journey in medicine led you to this point in your career?

Most of my career has been in academic institutions. I first worked at the Barnes-Jewish Hospital in St. Louis, which was a wonderful place to work and meet with many outstanding pathologists. I was later recruited to the University of Maryland Medical Center with them providing me with a research lab and starting fund. As the Director of Hematopathology, I was able to build up the Hematopathology Section by recruiting additional faculty and streamlining an integrated hematopathology service. I also built up the Hematopathology Fellowship program at the Medical Center.

As the Service Director, I started to think about the financial impact of the tests performed in the pathology department. We always tried to find ways to run the lab more efficiently so that we could improve cost effectiveness. This motivated me to learn management and earn an MBA through the University of Maryland Smith School of Business. That was a period of my life that I had to work very hard. I did not have very much of a life outside of running a busy clinical service, a research lab, and attending business school. Despite how busy I was, I was still able to publish several impactful papers that helped advance my career. Once my MBA was concluded in 2012, I was recruited to the University of California San Diego/San Diego VA Medical Center as a Clinical Core Lab Director and helped consolidate the pathology labs. With the intention to assume more responsibilities, I came to Phoenix VA HealthCare System as the Service Chief of Pathology right after the Lab had experienced some tragedies. I took on the challenge to help the Lab turn around and improved the services. Since then, we have hired many exceptional faculty and staff and made the department much better. In 2018, I was so fortunate and

honored to lead this brand-new Department of Pathology at the UArizona College of Medicine - Phoenix.

What do your responsibilities as Chair entail?

My priority as the first pathology chair at the UArizona College of Medicine - Phoenix is to build up the department pretty much from ground zero. Dean Reed has been very supportive of this endeavor. We are recruiting more faculty and building up our team, even though we still need an academic department at the Banner University Medical Center, but we are working on it.

The department has three major missions – education, clinical service, and research, which are in alignment with the missions of the UArizona College of Medicine - Phoenix. We work to provide the best pathology teaching to our medical students. I strongly believe that teaching should be carried out by practicing pathologists, so that medical students would learn what pathology and pathologists really look like, and they can get practical answers for their pathology questions. Another responsibility is to build up our clinical programs. This includes pathology residency and fellowship programs, and laboratory scientist/ pathology assistant programs. Currently, the residency program is our top priority. We are very close to starting a residency program with the help of Phoenix Children's Hospital, Phoenix VA HealthCare System, Banner University Medical Center, Maricopa County Office of Medical Examiners, and the Mayo Clinic. We will hopefully start our residency program sometime in the next few years.

"We are essentially the Doctor's Doctor."

How has the field changed throughout your career and how do you anticipate it changing further?

People sometimes reach out to me inquiring about using AI for pathology diagnosis. AI has not truly reached the point to replace humans in pathology yet. There is so much variation on pathology slides, such as tissue section thickness, staining artifacts, and many more. I think AI will have a place in assisting, but not replacing, pathologists.

Genetics and genomic sequencing will continue to develop in pathology labs. Next generation sequencing becomes routine now, though it is still too costly to sequence all the genes. In the future, as genetic testing becomes more affordable, we could target oncogenes in cancer therapy as a standard of care, which would allow us to practice better precision medicine. We will continue to pair advances in genetic testing with the development of targeting pharmaceuticals.

How do you balance your professional and personal life?

Having good sleep is my priority. I usually get up around 4 AM and go to work before 6 AM. I sometimes have to stay late to complete my responsibilities. Running a lab service and a department takes a lot of effort. Regardless of how busy I may be, I like to respond to messages in a timely manner since I know when people message me, they are eager to get an answer. To shake off a week's stress, I jog on the weekends. I usually run five miles a day, which is something I look forward to. Sometimes I also take a walk with my wife. All these keep me fit and healthy. It is important to take a day off during the week so that you don't burn out.

What thoughts would you like to share with medical students considering a career in pathology?

Because of the organ system-based curriculum, pathology does not get as much visibility with medical students, which may give some students the impression that pathology is not that important. However, that is a wrong perception since understanding disease is the basis of medicine. If you want to be a good doctor, you must understand pathology well. Even though pathologists do not interact with patients as much, we provide the diagnoses and therapeutic targets to guide patient care. We are essentially the "doctor's doctor".

Pathologists are also advisors. We provide advice to all the other doctors on laboratory tests. A physician in one specialty may not need to know very much about another specialty, but a pathologist needs to have a broad basis of knowledge since pathology touches all the specialties. If you love medical knowledge as a medical student, pathology is a good choice for you.

There are a lot of opportunities for research as a pathologist. You can readily access patient specimens since they are stored in pathology. Many medical discoveries were made in pathology, which makes pathology, as a specialty, critically important for the future of medicine. You can be very proud of being a pathologist.

Pathologists also have a good lifestyle, which allows for a balance of family and work. Pathology is almost a perfect specialty if you want to have regular family time since the working hours are generally regular.

- Jacob Shaner, MS2

Summary Statistics on U.S. MD Seniors Pathology - 2022

	Matched (n=181)	Unmatched (n=3)
Mean number of contiguous ranks	12.6	3.0
Mean number of distinct specialties ranked	1.1	1.3
Mean USMLE Step 1 score	233	226
Mean USMLE Step 2 score	245	232
Mean number of research experiences	3.4	3.0
Mean number of abstracts, presentations, and publications	8.5	1.7
Mean number of work experiences	3.2	2.3
Mean number of volunteer experiences	6.0	5.3
Percentage who are AOA members	11.0	0.0
Percentage who graduated from one of the 40 U.S. medical schools with the highest NIH funding	30.9	0.0
Percentage who have a Ph.D. degree	22.3	0.0
Percentage who have another graduate degree	17.2	33.3

Source: National Resident Matching Program, Charting Outcomes in the Match: Senior Students of U.S. Medical Schools, 2022. National Resident Matching Program, Washington, DC 2022.

Kristian Schafernak, MD

Associate Professor
The University of Arizona College of Medicine – Phoenix

Dr. Kristian Schafernak is board certified in combined Anatomic and Clinical Pathology as well as Hematopathology by the American Board of Pathology, and in Molecular Diagnosis by the American Board of Clinical Chemistry. After working in private practice and later as an academic pediatric hematopathologist at Northwestern in Chicago, he joined the medical staff of Phoenix Children's Hospital in 2015. He is currently an Associate Professor of Child Health and Pathology at the University of Arizona College of Medicine - Phoenix.

Tell us about your journey into pathology and why you love the field.

I will start by saying that in the late 1990s, when I entered medical school, I was NOT anticipating a career in pathology and laboratory medicine. Because of a long hospitalization as a child, I was thinking maybe I'd become a pediatrician, or maybe a neurosurgeon since that sounded cool. The medical school curriculum was discipline-based at the time and the big course in second year was pathology. The professor was a brilliant old British guy who seemed to know everything about the basic sciences as well as clinical medicine. One week was devoted to skin pathology. There were lectures by some dermatologists and a dermatopathologist, and then that Friday, we had clinic. They herded us in small groups through a series of patient rooms to show us someone with the characteristic malar rash of lupus and so on; I think someone had a rash on their butt or something. The others in my small group didn't interact much with the patients, they just looked at their skin condition and moved on to the next room without saying anything or interacting. I thanked each patient for being there for us like living textbooks because they were sacrificing their time and a bit of personal modesty, especially the guy with the butt rash! Anyway, the final room was set up with five microscopes, each with a slide illustrating various conditions like scabies or basal cell carcinoma. I loved talking to the patients but this was unexpectedly cool. Nevertheless, I was a little in denial about enjoying it because it was not a specialty I had given any thought to, nor one that any of my classmates were talking about, but I found a way on each rotation during third year to explore pathology. Later, as a resident, actually during my second month of residency, I learned that I loved hematopathology and how it is so clinical and makes for such a close partnership with oncology colleagues. I find it very rewarding knowing that I, as a laboratory-based physician at a pediatric hospital, can order and then perform whatever testing I need to make an extremely fast and accurate diagnosis so that treatment can start right away for kids with leukemia.

How did you get involved in teaching?

I don't want trainees to think that all we do in pathology is teach, because 100% of what I do is clinical medicine. But pathology as a specialty naturally lends itself to teaching (and research, for that matter) because we see disease with our own eyes on a macroscopic, microscopic and even molecular level. In addition to traditional lectures and discussions, I am proud to have been given the opportunity to become involved in the leadership of some important educational initiatives that allow us as educators and have an impact far beyond the walls of our own institution, particularly for learners in developing countries across the globe.

What would you tell a first or second year medical student who may be interested in pathology?

I would say it's never too soon or too late to start the discernment process. It does seem hard that you will

need to choose a specialty before and without rotating through everything. It is also equally important to learn what you don't like as what you do. Personally, if someone comes to me to learn a little about what I might do on a typical day, I do not put any pressure on them to go into my field. I want to let them know what I love about the field but balance that with what I might not like or what others might not like. The best way I can serve a student is just to be there and try and facilitate their process of exploration, whatever that means for them, and at their own pace. I would tell them not to believe the stereotypes about any field because those are not usually based in reality.

How can students get involved in pathology at your site during their training?

I want to emphasize that students are welcome to shadow us anytime – we love showing people what we do. It is going to sound morbid, but at the children's hospital, we are happy to have students on their pediatrics rotations attend autopsies if their patient dies (that's an area I don't love and don't do--hard for me as a dad) or to look at surgical specimens or biopsy slides with us, or to attend one of our many intra- or interdepartmental conferences. Students are welcome to join us for a one-month elective rotation, too.

What is something a lot of people don't know about your line of work?

Well, when a lot of people think about pathology, they think of crime scenes and autopsies – it's very dramatized, and that's such a small part of what pathologists can do. I've done exactly 2 autopsies in the last 15 years—I work with the living. What is really cool about pathology is how easy it is for us to get a consult or another opinion. We don't need to send a patient anywhere, maybe just walk down the hall or FedEx some slides. We are constantly sharing cases, and this is a really good thing for patient care. Every patient with a new cancer diagnosis is having their biopsy reviewed by at least two pathologists and often the entire department--it is absolutely necessary to get this right. And we don't just share cancer cases. We are often able to handle everything within our own department by using our combined brainpower and experience and the tools we have available in the lab like immunohistochemistry or flow cytometry immunophenotyping. We increasingly use genetic and genomic testing to corroborate or refine a diagnosis, or provide information on prognosis, or identify a therapeutic option so that less toxic/more targeted therapy can be given (we in pathology are always looking for that, as these are our patients too!). For me, probably the most fun case is making a challenging diagnosis I've never seen or made before. But every year or two, I get stumped and have to send a case to a friend at the NIH. We learn so much from the process. Pathology is, in many ways, an open-book specialty or a team sport. We have lots of really smart and talented techs too, who are unsung heroes doing the heavy lifting in our department. They are there 24 hours a day taking care of patients.

Would you like to share a fun fact about yourself or a hobby you enjoy?

> **" 'Approach each rotation as if you were going into that field for the rest of your life.' "**

Although COVID-19 put a damper on it, I enjoy singing in the choir at our church and I also like going to the gym with my wife and older daughter. A little over two years ago, I started training in Aikido, a Japanese martial art.

Do you have any parting words of advice?

I will give you one bit of advice that a surgeon friend told me when I was a medical student. He said, "Approach each rotation as if you were going into that field for the rest of your life." If you do that, you will get the most out of every experience, and it kind of makes sure you are keeping your mind open. So keep your mind open to pathology and everything else. We, your faculty, are here to serve you as you explore your options. Please don't hesitate to e-mail me at kschafernak@phoenixchildrens.com, if there is anything I or your other faculty can do for you!

- Naria Quazi, MS2

Jeff Johnston, MD

Chief Medical Examiner
Maricopa County Office of the Medical Examiner

Dr. Jeff Johnston is the Chief Medical Examiner for the Maricopa County Office of the Medical Examiner, a position he has held since 2013. Dr. Johnston holds a Bachelor's Degree in Biology from the University of Virginia and a Medical Doctorate from the University of Louisville School of Medicine. He trained in Anatomic Pathology at the University of Tennessee Medical Center at Knoxville, home of the University of Tennessee's Anthropology Research Facility. He has subspecialty training in Forensic Pathology from the Miami-Dade County Medical Examiner's Office and is Board Certified by the American Board of Pathology in both Anatomic Pathology and Forensic Pathology.

When did you first become interested in pathology?

I didn't get a lot of exposure to pathology in medical school, but I luckily did an elective in between my first and second year with a pediatric pathologist due to my interest in pediatrics. I wasn't sure what field of medicine I wanted to do. I had no physicians in my family, and I grew up in a small town, so the only contact I had with medicine was the local family doctor. During the elective, I was mostly doing hospital surgical pathology looking at tumor slides, but one day the local forensic pathologist came to do a consult with the pediatric pathologist on a child death case. That was the first exposure I had to that field of medicine, and it piqued my interest. As I went through my training, I found myself drawn to acute medicine fields. I had been leaning towards pediatrics and general surgery and, late in my medical school career, realized I really wanted to focus more on the diagnostic fields. I initially got interested in going to medical school from doing AP Biology in high school and being fascinated with how life works. Physiology and anatomy were always fascinating to me, and my undergraduate degree was in biology. I went to our Dean of Students and told her I was thinking about forensic pathology, and I was later able to find a program in Knoxville, Tennessee. It was in a community hospital that not only had surgical pathology, but also the regional forensic center for forensic pathology work too. Because of this, I was able to get a lot of exposure to forensic pathology in my residency and fell in love with it. From there, I did my subspecialty training at the Miami-Dade County Medical Examiner's Office, which is a great program where forensic pathologists do much of the scene work themselves. This gave me a lot of continuity with working out the case from start to finish. Then I came out here after that.

You seem to hear a lot of stories about people transitioning from surgery into a diagnostic field, including in your case. What are your thoughts on that trend?

I'm not sure we talk enough, especially early in medical education, about the ways to think about the kind of field you want to be in. When I was going through school 20+ years ago, the only division anyone talked about was medicine and surgery. Somewhere along the way I stumbled on this idea of acute versus chronic medicine. Certain physicians want to make a diagnosis and treat patients and that's enough, and some are more drawn to creating a long-term relationship with their patients. I thought that was useful moving forward, and then later on I found that I was more drawn to stopping at the diagnosis. I was less interested in learning management algorithms, treatment approaches, and the management side after the diagnosis. As I found my energy and interest waning towards those fields, I began focusing on the diagnostic fields instead.

Why should medical students consider pathology?

I think students should consider pathology if they have an interest in diagnosing and understanding the pathophysiology of diseases. A lot of folks view the practice of pathology, particularly in a hospital setting, as the physician's physician, similarly to the way radiology works. My specific subspecialty in forensic pathology is a unique animal in medicine for a lot of different reasons. We're practicing medicine in a context that allows you to learn an awful lot about the rest of the world. I remember going out to the scene of a person who was hit by a train and there were railroad investigators looking at the tracks walking up and down them. I asked what they were doing, and they said we're looking for where the sand starts and I'm like, "Okay, tell me about that." They explained how the emergency system on the train releases sand to increase the friction for it to stop faster, and how we'd be able to figure out when the operator of the train engaged the emergency brake and calculate where they were, how fast they were going, and all the other ways they could use that information. All those little tidbits were really fascinating to me.

"Forensic pathologists are helping us understand what happened by collecting information about those deaths. They identify what could be risk factors or associations that help us find inflection points where we can intervene and have a better outcome for the living. What we're all trying to do is put ourselves out of business."

Additionally, there's an impact that we're playing on the public health front. In forensic pathology, we're treating the whole community. In Maricopa County, it's almost 4.7 million people now that we can look at as a single patient whose cases are like biopsies of incidents that happen in our community. We analyze them so we can have a deep understanding of all the injuries, intoxications, and many other things that occur. Because of this, we can identify trends and make correct conclusions about what has caused somebody's death. We can then collect data around those deaths so that folks like epidemiologists and public health officials, along with the broader institutions and society like policymakers, law enforcement, or Consumer Product Safety, can try to design interventions that reduce suffering and death in our community. We always have limited resources to try and make an impact, so we're providing surveillance for that, and then when things are implemented, we can see if it's working or if we need to approach things in a different way. It's a truly impactful side of medicine that we don't talk enough about. People can get focused in the weeds of us seeming to just be looking into a microscope all day. Some aspects of that are definitely true, but I would want everyone to know about the broader implications that our field of medicine has.

What areas can the field of forensic pathology improve on?

For forensic pathology, additional context is helpful. We're generally not practicing in hospitals. We're practicing in government agencies and are usually at county or state level agencies. There are laws about us needing to do medical investigations for deaths that fall under these circumstances so that we can do community surveillance and understand what's going on. Of course there are implications for all those systems we talked about and the one you see on TV all the time is criminal justice and forensic pathologists testifying criminal cases. That's certainly a big impactful thing, but it's about 5% of our caseload. Additionally, there's a lot of demand for forensic pathologists, so you can view that as either a positive or negative. There's a lot of job security, but there are places really struggling with the shortage of forensic pathologists. We need a lot more forensic pathologists to join our ranks.

Are there any stereotypes you've heard about pathology that you think are inaccurate?

I think there is this view of pathologists as folks who are in the basement and don't want to talk to other

humans. I think that there probably is some truth to finding more introverts, but we certainly talk to folks on the criminal justice side and families about how their loved one died. Those can be challenging but also rewarding conversations to have. Then of course, we communicate with all of those other officials that are trying to do their job such as public health officials and policymakers. There are definitely opportunities for more interaction but in just a bit of a different way.

How has your day-to-day schedule changed since becoming Chief Medical Examiner?

Most forensic pathology is pretty consistent shift work. Our docs come in around 6:30am and they're done at 3:30pm every day. They do their cases that they're assigned for conducting exams, but they're not assigned new cases every day. We're one of the busiest offices in the US, so we have a pretty large staff. We structure it so they have about 7 or 8 exam days a month. The other days they're working on their reports and gathering all the other information that they need to arrive at a reliable conclusion. In forensic pathology, our work product is that medical examiner report along with the death certificate. These communicate how the death was reported to us, what happened to the patient, what we found with our exam and lab studies, and our conclusion about why they died. Working as Chief Medical Examiner, it's fairly consistent schedule-wise now that I'm in a more administrative role. I certainly have to react to daily challenges that come up. However, a lot of it is longer term projects and learning how to do something that's on a 3-year plan and making sure we're continuing to make progress in that direction with the opportunities and setbacks that come along. It's a little more macro versus the casework that you get into a routine with in a non-administrative role.

Is there anything big on the horizon for the field of forensic pathology?

With the opioid crisis, climate change, and particularly here with heat related deaths, all of these real public health problems that we're working together to try and solve, there's a light bulb turning on. Forensic pathologists are helping us understand what happened by collecting information about those deaths. They identify what could be risk factors or associations that help us find inflection points where we can intervene and have a better outcome for the living. What we're all trying to do is put ourselves out of business.

I've also seen more resources be applied to our field. When I entered the field, there were a lot of facilities that were not in great shape; now, most people operate in nice, modern facilities. There's also a trend towards the application of more advanced radiology and how it can be applied. We're still mostly doing X-rays and full body scans looking for injuries and identifying features, but there are a few academic centers that have been working on using CTs, and even rarer, looking at MRIs in the postmortem setting to identify things that are harder to detect at autopsy.

Another thing is molecular pathology and understanding genetics and genetic risk factors. In forensic pathology, we're searching for risks for functional abnormalities that we are not able to detect at autopsy, in which we typically identify structural consequences of those functional problems. We can look at somebody's kidneys and tell whether they have a history of hypertension, but we want to take that to the next step for the things we can't see and get molecular autopsies for us to understand more.

What final thing would you want students interested in pathology to know about the field?

I would say if you're interested in a field that has a good work-life balance, pathology is something to consider. We do take call, but those are mostly phone calls. In a big office like ours, we send investigators to scenes who act as our eyes and ears and collect data there, so our docs are usually not going out to scenes in the middle of the night as you might otherwise think.

- Joshua Willis, MS2

Savanah Gisriel, MD, MPH

Chief Resident, Alumna
Yale-New Haven Hospital

Dr. Savanah Gisriel is a Chief Resident in Anatomic and Clinical Pathology at Yale-New Haven Hospital in New Haven, CT. She graduated from the University of Arizona College of Medicine – Phoenix and the Mel and Enid Zuckerman College of Public Health in 2019. Her most recent research endeavor includes elucidating the clinicopathologic characteristics of human herpesvirus 8-negative effusion-based large B-cell lymphomas. After residency, Dr. Gisriel will complete her Hematopathology fellowship from 2023-2024 at Yale-New Haven Hospital.

When and how did you become interested in pathology?

I honestly didn't know that pathology was its own specialty (with its own residency program) until I started applying to medical school. I knew that pathologists existed, but I thought that they really only performed autopsies. It was when I started exploring the field of pathology and reading about all the different subspecialties within pathology that the profession became intriguing to me. I learned that there was so much variation in what a pathologist could pursue. Sure, you could perform autopsies if you wanted (in either the forensic or hospital setting), but you could also become a blood bank director, an academic surgical pathologist, a clinical microbiologist, or even a founder of an international bioinformatics company. The possibilities are endless. And in surgical pathology, in particular, you are responsible for understanding and communicating all aspects of disease, from the macroscopic presentation all the way down to the microscopic (and even molecular) level. To me, that sounded like a perfect way to spend my day.

During my first two years in medical school, I also talked with a few pathologists who shared aspects of their day-to-day life and the types of cases they see in their practice. All the pathologists I met were very nice, humble, loved their job, had great work-life balance, and were very fulfilled in their career. After that, I became interested in learning more and pursued pathology further by completing rotations in pathology during my fourth year of medical school. I have been hooked ever since.

Considering pathology is not a field that many medical students get exposed to during medical school, what advice do you have for students who are considering this field?

You're right, not a lot of medical students get exposed to pathology during medical school! If you are considering pathology as a career, I recommend participating in as many away rotations in pathology as possible - and also shadowing pathologists in the Valley when you can. When you are choosing your away rotations, try to prioritize departments with robust pathology residency programs. And when you're there, I think it's very important to see how residents interact with attendings on a daily basis. During my three months of away rotations, I made sure to pick three programs that were different from one another in terms of geography and program structure (such as the Pacific Northwest vs. the Midwest vs. the Northeast or community-based hospitals vs. large academic centers). I really loved all my pathology rotations (which is one of the reasons why I knew this was the perfect specialty for me), especially the one at Yale, which is where I am now completing my residency training. Completing away rotations is not only helpful in terms of learning more about pathology and confirming it is the right field for you, but also helpful for when you soon apply to

these programs. When I interviewed at programs where I had away rotations, the residents and faculty recognized me during the interview, which probably helped me stand out. So bottom line – if you are considering pathology as a career, make sure you complete away or in-house rotations in pathology!

What things do you think made you a strong applicant when applying to pathology?

I think the fact that I did away rotations at the residency programs I was interested in showed that I was passionate about joining the field. By completing those rotations, I was also able to ask more targeted questions during interviews and knew how to answer certain questions.

"I've never met one pathologist who didn't do everything they could to help me succeed."

Other important activities during medical school included research, volunteering, and tutoring. Research does not have to be wet lab/benchwork (though if you like benchwork I suggest doing it!); choosing a research topic that you are particularly passionate about is the most critical aspect. All pathologists value and prioritize scientific inquiry, so research is something that you can and should discuss during residency interviews. I do want to preface, though, that I did NOT have a lot of publications under my belt when applying to pathology residency. And that is okay. As long as you are committed to something (such as giving back to your community in some way), and can talk about that activity during an interview, don't worry. For volunteering, I was involved in Saturday Scrubs and had a great time educating high school students who were interested in pursuing careers in medicine and science. The other thing that makes for a strong applicant is passing board exams. Step 2 scores will still be important, even with Step 1 becoming pass/fail.

Lastly, I want to point out that during interviews, most programs simply just want to get to know you better and understand you as a person. They want to understand how you work with others. This can be exemplified in your recommendation letters and also in the way you interact with everyone you encounter on your interview day.

When applying to residency, what did you look for in a pathology program?

Good question! The first thing I would look for is how happy the residents are, and I would try to talk with the residents one on one if possible. Look for how the residents interact with each other and the way that they interact with you. I think that's very reflective of the program.

Then there are other things like how the gross room is set up and how much pathologists' assistant (PA) support the program has. For example, here at Yale, we have amazing PAs who are grossing experts and always available to teach the residents. They really helped enhance my skills when I was a junior resident. I would also ask if the program provides educational funds to help residents with things like textbooks/online resources for exam preparation, traveling/lodging expenses for conferences, etc.

Lastly, depending on what you are planning to do after residency, see if that program matches your career goals. For instance, if you want to become an academic pathologist that teaches residents and medical students, think about joining a program at a teaching hospital. If you want to work in private practice later on and prefer general sign-out as opposed to subspecialty sign-out, think about joining a program at a community-based hospital.

Did you have any mentors or experiences during your path that helped solidify your interest in pathology?

Yes, I did! I had quite a few mentors actually. The first one was Dr. Fischione who is a forensic pathologist. He gave a lot of lectures to medical students when I was at the UArizona College of Medicine - Phoenix. When I told him I was interested in pathology, he gave me all these slides of normal tissue to look at. He was so enthusiastic and wanted me to know how great of a specialty it is. Now I understand why - it's truly a hidden gem in medicine.

When I rotated with the Yale Pathology Department as a fourth-year medical student, I didn't know that I wanted to pursue hematopathology for fellowship later on, but after only one week into hematopathology sign-out with Dr. Siddon (one of our stellar hematopathologists) I fell in love with hematopathology. She was just so down-to-earth and I felt like I could ask her any question and she wouldn't hesitate to give me an honest, thoughtful answer. I aspired to be like her (and still do!).

I think it's really important to find people that are going to support you and root for you throughout your journey during medical school and residency. Try to find mentors for different things, such as for research, specialty interests, and even for non-work-related parts of your life. Find a mentor who you can turn to and say, "I have this thing going on in my life. What are your thoughts on it? What would you do in this situation?". It is really important to find those earlier on rather than later, because they are going to open doors for you. They are going to help you in any way they can because they've been in your position before. I've never met one pathologist who didn't do everything they could to help me succeed.

What is one thing you did not know about pathology before starting residency?

Honestly, I didn't realize the vast breadth of pathology as a specialty. For instance, I didn't know you could direct a blood bank as a pathologist. We have some pathologists who have now started their own companies, some who are forensic-trained and go to court to testify for homicides, some who work as clinical microbiologists and identify rare organisms, some who develop cutting-edge molecular techniques, I could go on and on.

I didn't know there were so many different things you can do as a pathologist, and I wish more people knew about this specialty because I am sure we would have more people going into it. It's truly a fulfilling job. I will always remember what one of my mentors, Dr. Sinard, told us residents on our first day: "Let's say you sign out about 50 biopsies per day, maybe even more. At the end of that day, you have made a huge impact on 50 people. You are probably changing their lives forever from that point forward with your diagnosis and there are not many other professions out there that can say the same thing."

- Ghena Krdi, MS2

Positions Offered in Pathology, 2018 – 2022

2022	2021	2020	2019	2018
No.	No.	No.	No.	No.
631	611	603	601	601

Source: National Resident Matching Program, Results and Data: 2022 Main Residency Match®. National Resident Matching Program, Washington, DC 2022.

Match Summary for MD Seniors Applying to Pathology– 2022

			No. of Applicants		No. of Matches		% Filled		Ranked Positions	
No. of Programs	Positions Offered	Unfilled Programs	MD Seniors	Total	MD Seniors	Total	MD Seniors	Total	MD Seniors	Total
168	631	10	248	994	231	619	36.6	98.1	2,924	8,135

Source: National Resident Matching Program, Results and Data: 2022 Main Residency Match®. National Resident Matching Program, Washington, DC 2022.

Nicole Deatherage, MD

PGY-1, Alumna
The University of Arizona College of Medicine – Tucson

Dr. Nicole Deatherage graduated from the University of Arizona College of Medicine – Phoenix in 2022 and is a current PGY-1 in Pathology at the University of Arizona College of Medicine in Tucson. She completed her undergraduate education at Arizona State University with a major in criminal justice. She hopes to eventually pursue a fellowship in Forensic Pathology. In her free time, she enjoys spending time with her husband, watching movies, and listening to classical music and true crime podcasts.

When and how did you know you were interested in this field?

My interest in pathology started back when I was about 5 years old. Apparently, this is relatively common for people in pathology to get into it early, which I didn't really expect. I met the forensic anthropologist from Maricopa County because her son was on my brother's soccer team. We just ended up talking, and she taught me about forensic anthropology and bones.

I thought, “Oh, I'm going to be a forensic scientist when I grow up!” During middle school, once I learned what forensic pathology actually was, I was sure it was what I was going to do. Then I realized I would be going to medical school to achieve that goal. That had been my focus for several years.

Once I started volunteering at the medical examiner's office in undergrad, everything was definitely solidified. I knew this is what I wanted to do and that I could handle it.

Pathology can sometimes seem like the ugly duckling specialty. Most students don’t go into medical school planning on not working with patients on a daily basis.

What do you wish you would have done differently in the first three years of medical school to prepare you for now?

In terms of doing anything differently, I lucked out by already knowing what I wanted to do. That being said, realizing early on whether you're more interested in the diagnostic or treatment side of medicine could help you determine if you want to pursue pathology.

I did gain greater perspective during medical school, especially in third year and fourth year on rotations. Everyone takes biopsies and needs a definitive diagnosis, and you can find a connection to pathology in most rotations.

You do tend to get the most exposure to pathology during your pre-clinical years, especially when studying for STEP 1. However, when you enter residency, they do not expect you to remember much since medical school focuses on other areas.

What led you to pursue this field over others? How did your medical school experience impact this decision?

Nothing hit me as much as pathology did, and I think getting that experience in undergrad really helped. I was already about to get a lot of insight into forensics from my volunteering.

It's very much an extrovert’s world in medicine. After a day of clinic talking to patients, I often felt drained as opposed to other students who are energized. I'm more introverted than a lot of people in medical school. After a day of work in residency, I feel great. For example, today I got home and studied. It felt great.

Lifestyle also influenced my decision to pursue pathology. During medical school, I realized I don't really like being at work at 5:30 AM to pre-round,

and I don't really like being there until 7:00 PM on a regular basis. I like having my work life balanced, pretty cut and dry.

Some students think that pathology means they would just sit by a microscope all day. But there are so many different fields in pathology. Blood banking, transfusion medicine, and other clinical pathology specialties offer a different approach to pathology than you might realize.

What advice would you give students considering this field and any general pieces of advice?

Get experience in pathology. One of the things residency programs really want to know at interviews is if you know what you're getting into by pursuing pathology. Do you have an idea of what a day looks like? Unfortunately, a lot of people use pathology as a backup specialty. If they don't get into something they want, they think that pathology is not too competitive, so they apply. However, it's a field you must love, otherwise you'll be unhappy.

"But in the first couple years of medical school, your most important job is to learn the basics of medicine. If you do that, you'll be set up to do well in your third year, regardless of what specialty you want to go into."

In residency, what you lack in hours at the hospital some days you make up for by studying. If you don't, you don't know anything. It's basically like starting medical school all over again. Put in the effort in medical school, even though you know you're not going to necessarily use most of the information in your daily practice in the future.

Make sure you get experience in pathology and know a little bit about both the anatomical and clinical sides. Residency programs want to make sure you know a little bit about both areas. In my case, since I already knew I wanted to do forensics, I also got a lot of questions in interviews making sure I understood why I wanted to do forensics versus a different field in pathology. I had to know enough about different areas in pathology to answer the questions well.

But, for the most part, the interviews are really relaxed. They just want to make sure that you enjoy pathology because it would be miserable to not want to do it and be stuck in residency.

Were there any resources on campus or mentors you found most helpful to solidify your decision to go into this field?

I had contacts at the medical examiner's office from before medical school. That was something I kept doing even while I was in medical school, since I wanted to keep getting experience and keep solidifying what I wanted to do.

There was also a member of the teaching faculty, Dr. Fischione, who was a great connection for me. Though he doesn't teach at the school anymore, I would recommend reaching out to pathologists that give lectures you are interested in to be able to find opportunities by networking with them.

Other than that, I was very much a hermit and did things on my own. There was no one else in my class who was interested in pathology. However, if there is someone else in your class who is interested, I would recommend working with them so that you can both find more experiences and connections in pathology.

How did you prepare for your residency applications? Was there anything you would have done differently?

Given my situation, the majority of my residency application did not change very much from my medical school application.

However, an important skill to have in residency interviews is to communicate that you are passionate about pathology. They want to make sure to take in the right people since it is a bit of a shrinking field. At least here in Tucson, they don't have enough people to really keep up with the volume of cases. Residency programs want to bring in people who will stay in pathology and hopefully bring others to the field.

Also, make sure to request letters early. That is the one thing you can't really control, and it can be stressful to try and find people who know you well enough, can vouch for you, and know that you love pathology. It doesn't need to be a pathologist. It can be really any clinician who understands your situation and can recommend you. One of my letters was from a pediatric surgeon. He knew I wanted to do forensics the entire time and thought it was the coolest thing ever. And even though I was super passionate about forensics, I was still on the ball during my sub-internship with him. It is important to show a good work ethic on your rotations.

What was different about how you had to apply to residency versus your peers?

The number of applications I had to send out and the number of interviews I had definitely varied from my classmates going into other fields. One nice thing about pathology is that it's not very competitive. If you can show that you really love pathology, you will probably match somewhere. I applied to 15 programs and got 11 interview invitations. I could have applied to more programs, but I was limited by location and family considerations.

The personal statement in pathology is not standardized like in some other specialties. It is much more personalized and focused on who you are and why you want to be a pathologist.

Do you have any hobbies or things you do outside of work? How is general work-life balance in your field?

In residency, the work-life balance is awesome at my program. Surgical pathology is the more intense rotation, but even then, I think the latest I stayed was until 7 PM. So compared to other specialties, that's basically nothing. On autopsy, if you don't have a case you just study all day. It's very relaxed and self-directed. I'm glad I don't have to be on my feet all day like many people have to do in clinical specialties.

In terms of hobbies, I have been watching "Better Call Saul". My husband and I also have a cat. I enjoy vegging out at the end of the day after working in residency.

- Jacob Shaner, MS2

Matches by Applicant Type for Pathology - 2022

No. of Positions	Number Filled	MD Senior	MD Grad	DO Senior	DO Grad	Others	U.S. IMG	Non-U.S. IMG	Number Unfilled
631	619	231	29	76	9	0	62	212	12

Source: National Resident Matching Program, Results and Data: 2022 Main Residency Match®. National Resident Matching Program, Washington, DC 2022.

Pathology Interest Group at the UArizona College of Medicine – Phoenix

Leadership Chair
Jacob Shaner

Faculty Advisor
Dr. X. Frank Zhao, MD, PhD, MBA

https://www.uacomps.org/orgs/pathology-interest-group

Alden Miller

MS4
The University of Arizona College of Medicine – Phoenix

Alden Miller is a fourth year medical student at the University of Arizona College of Medicine – Phoenix. She is originally from San Clemente, California and received her undergraduate degree in Biomedical Science from Northern Arizona University. Her hobbies include running, hiking, and watching B-horror movies.

What led you to become interested in pathology? We are exposed to it early in medical school, so did that spark it or were you already interested?

I actually came to medical school already interested in pathology. It wasn't necessarily anything I saw in medicine initially that sparked my interest. I've always been very interested in anatomy and learning stuff from smallest to biggest structures. When I took anatomy in high school and had dissections, I thought those were really cool and wanted to do that sort of thing all the time, so the love for path was always kind of there. I also did an internship in my undergrad at the Coconino County Office of the Medical Examiner doing autopsies and going to scenes of deaths, so my specific interest is actually forensic pathology.

Since you already knew you were interested in pathology, did you tailor your medical school experience to it?

Oh yeah, absolutely. I had to restart the Pathology Interest Group since no one else was doing it, so that was fun. I also found a forensic pathologist as a mentor for my scholarly project. I think that's a great thing to be able to put on your resume, and it makes the project much more engaging to be working in a field you know you want to go into.

Did anything in medical school push you more towards pathology?

When you go into medical school, I think the required rotations are a good way of confirming your interests. You could end up getting exposed to something you've never previously seen and just feel like, "Wait, I actually love this thing." I really enjoyed my experiences, but they also really just confirmed for me that pathology was what I wanted to do.

Do you have any advice for other students interested in the field?

Because pathology is kind of a niche field, I think part of the challenge is that students don't get fully exposed to it. It's a super broad field that includes forensic pathology like autopsies, crime scenes, and death investigations, which is my field. But that can be really different from clinical pathology, where you might do more molecular pathology or cytopathology. You can specialize a lot, so I'd highly recommend reaching out to faculty and shadowing as much as possible, including during Capstones or on away rotations. Pathology is really all about getting exposure to the field.

How did you discover forensic pathology specifically?

So, when I realized I liked dissection and all that stuff, I was curious about how I could apply it. My dad loves crime shows, and when I walked in one day and saw medical examiners talking to detectives on TV, I thought, "Wow, she has the coolest job" and then I realized I could do that. And at that point, I was just like, "I'm going to medical school I guess," and that was actually why I entered medical school in the first place. It definitely requires exposure and being pretty gung-ho about the field to hear about it, and most medical students won't ever even see an autopsy. I think it's really important to be able to find out exactly why people are dying and give families that closure, and to be that person you need to

understand every process in their bodies and find out what made those processes stop working.

How did the match process work for this field?

Match for pathology works via the regular residency match; it doesn't have its own thing or require a supplemental application. Since pathology is a niche field, it is important to show that you have real interest and exposure, so make sure to shadow, volunteer, do research, and more. I would really recommend doing away rotations in 4th year so you can see how different programs handle the field and put all of that on your apps as well. I've done rotations in San Antonio, Texas and San Diego, California, and I will be going to Aurora, Colorado soon. It has been really amazing.

Do you have any advice for people who might struggle with pathology?

I know histology is often not a typical med student's favorite topic, so I have a two-pronged approach. It's very helpful to know what the basic tissue types are, like cuboidal cells, squamous cells, columnar cells, and more, and then tie them to functions. Even if you look at a slide and don't know what it is, you can make guesses at functions and locations when you recognize those basics and the functions they usually serve. That said, as medical students, it's all about repeated exposure, so make sure you get comfortable looking at common findings and high yield info over and over. If diseases have super specific histology, know that!

What do you enjoy doing outside of school/ class?

I'm very outdoorsy! I love being outside, hiking, working out, and really just any kind of active stuff. I've been using my free time in San Diego to try different sushi!

"I think it's really important to be able to find out exactly why people are dying and give families that closure, and to be that person you need to understand every process in their bodies and find out what made those processes stop working."

Any last bits of advice for underclassmen?

Medical school is a long road. It's really difficult, but you all got here because you're super intelligent and capable. Just keep believing in yourselves and you'll figure out what you want to do and kill it. Make sure to take care of yourselves; I believe in all of you!

- Salman Azfar, MS2

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Faculty Advisor: Lisa Shah-Patel, MD

If you have any suggestions for articles of interest, corrections, or comments for how we could enhance the newsletter, please do not hesitate to contact us at *lshahpatel@arizona.edu* or *comphx-specialtyinfo@arizona.edu*