Beth Israel Deaconess Medical Center | HARVARD MEDICAL SCHOOL TEACHING HOSPITAL

Getting to Know: Our Holman Research Pathway Scholar

Katherine (Katie) Van Schaik, MD, PhD, MA, one of our third-year diagnostic radiology residents, is also an American Board of Radiology (ABR) Holman Research Pathway Scholar. Named for nuclear medicine pioneer B. Leonard Holman, MD, and established in 1999, this national training program allows residents with strong research interests and clinical capabilities to move through residency in ways that support long-term research careers. The Inside View *recently spoke with Katie to learn more about this designation and how her highly specialized work aligns with our departmental commitment to clinical, research, and academic excellence.*

The Inside View: Thank you for taking the time to chat! To start, could you tell us a bit more about what the Holman Research Pathway entails?

Katie Van Schaik: It's my pleasure! This program allows residents to build on research they've already done and then expand on that as they move toward the next phases of their careers. So I'm very grateful that Beth Israel Deaconess Medical Center (BIDMC) and our department have allowed me to do this. In part, it emerged from work that I had done with our Division of Musculoskeletal Imaging (MSK) while I was still a medical student, which involved looking at more than 2,000 plain film radiographs I had taken of the bones of individuals who were interred in a crypt in a London church in the 1800s. Based on those images, we had published a couple of papers in *Academic Radiology, PLoS ONE,* and the *International Journal of Paleopathology,* and I wanted to keep building on that work. Participating in the ABR Holman Research Pathway allows me to do that through protected research time.

TIV: What sparked your interest in both ancient history and modern medicine?

KVS: I've done both for almost as long as I can remember. I was very fortunate that as a student at a public middle school in South Carolina, where I grew up, I had access to school-sponsored enrichment opportunities that involved both science experiments and the study of Latin. I loved them both equally and continued pursuing them through high school and then into college. When I was in college, I noticed some overlaps in the intellectual processes associated with both fields (that is, classics and molecular biology)—such as using evidence from multiple lines of inquiry to make hypotheses or diagnoses. I also saw quite a few similarities in terms of how both of these groups were using and critically evaluating evidence.

Through the help of my college mentors and by following my own curiosity, I found the field of bioarchaeology, which seemed like this beautiful blend of scientific tools and methodologies, and the contextual information that historians and archeologists could provide. I've always been a bit of an interdisciplinarian, so this field was (and remains!) incredibly appealing. Much of my research has coalesced in this area, specifically around the questions of "How do we define disease?" and "How has that definition changed over time?" Those have been my guiding research questions for a while and probably will be for the foreseeable future.

TIV: Could you talk about a BIDMC Radiology project that you have underway that you're particularly excited about?

KVS: That would definitely be the skeletal epigenetics project, which I'm undertaking with my research mentor, Dr. Jim Wu. This is a big project; we've been developing it for the last two years. It involves looking at clinical symptoms, medical histories, cross-sectional imaging (specifically CT imaging), and DNA methylation profiles of skeletal growth genes and genes that are known to be related to osteoporosis and osteoarthritis. DNA methylation is a type of epigenetic modification—basically, a way that the environment can interact with the genome to turn certain genes on or off.

As a field, epigenetics is regarded as an exciting bridge between our genetic code and the remarkable variability in genetic expression that we see. For example, for many disease processes, people can have similar genetic profiles related to a disease yet manifest that disease very differently. Osteoarthritis and osteoporosis work like this. Epigenetics can help to explain some of these differences in why certain people are more affected than others. We're looking at imaging, medical history, and epigenetic data for both modern populations and historical populations—our historical population is a group of 48 sailors from the British Royal Navy in the 1800s. Their skeletons show us that they endured and survived quite a few traumatic injuries!

TIV: This sounds like a fascinating project! What are its intended impacts?

KVS: The exciting thing about looking at these correlations in historical populations is that these populations are treatment-naïve; they have had no modern medications—it's just the human body in its normal physiology. And so these kinds of comparisons can be incredibly informative as we think about what is a "normal" process of human skeletal aging. We're also thinking about what the skeletal aging process looks like today in the setting of treatment with chemotherapeutics, both for cancer and things like osteoporosis.

The work that we're doing will hopefully help us to bridge these very diverse areas of genetic influence, environmental influence, and that gray area in between, namely epigenetics. So, I'm very, very excited about this research. We're collaborating with colleagues locally at Hebrew Rehabilitation Center, as well as in New Mexico, Ontario, Cambridge (UK), and London. It's a multicenter project that seeks to answer clinically-focused questions that relate to both

modern and historical populations and, hopefully, will yield insights that are useful for people interested in history and archaeology, too.

TIV: We will look forward to those results! From a big-picture perspective, how do you hope to influence modern medicine?

KVS: I guess the short answer to that is really through teaching and mentorship. I've done a lot of teaching on both sides of the Charles River, both at Harvard College and at Harvard Medical School, and I've taught lots of different courses, including history, Latin, and anthropology. Most recently at HMS, I've taught an interdisciplinary course that focuses on bioethics, the history of medicine, and healthcare policy. I've also been a radiology mentor for students and have done some radiology lectures. So I would say what I try to instill in students is a sense of those same research questions: How do we define disease and how has that definition changed over time?

Our definitions are what we have to work with on a day-to-day basis, but they are products of the world in which we live and the evidence that we have. Available evidence and how we interpret it changes over time. We are not always aware of the gaps in our ways of assessing efficacy, or of what we're overlooking as we frame our research questions. We're better in some ways than we were 300 years ago, certainly, but it's very difficult to see those blind spots. And that's part of how I hope to influence modern medicine: through a sense of that caution that comes out of recognition of historical errors.

It would also be really great if our epigenetics project can help shed light on the biomolecular factors that affect the development of osteoporosis and osteoarthritis since these processes affect nearly everyone!

TIV: For our aspiring radiologists who might be interested in pursuing a non-traditional path such as yours, what advice would you offer?

KVS: I'd say seek out supportive mentors. And, for me, that mentorship started with many of my middle and high school teachers and continued in the Harvard Classics Department. I was fortunate to find a continuation of it in the MSK section here at BIDMC with Drs. Wu and Eisenberg, and with our departmental leadership team, including Drs. Jonny Kruskal, Jim Rawson, and Yu-Ming Chang. I'm very grateful to them for seeing the potential of these ideas. And so, I would say, follow your passion in terms of what you're genuinely curious about, and then find supportive mentors who can help you refine those ideas and find productive ways for the answers to your questions to be of intellectual and clinical benefit.