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Q1 What led you to pursue a career in haematology, sparking your interest in stem cells, erythropoiesis, and other disorders which you are involved with?

For me, the first question is why did I go into medicine? In college I majored in biochemical sciences but hated the lab-based project that I was assigned. I was quite active politically, and I had an interest in both anthropology and in social justice. And so, being discouraged by the laboratory, and loving sociology and anthropology, medicine just seemed like the right place.

I spent a year travelling in developing countries between college and medical school as a Sheldon Traveling Fellow. When I came back, I was much more focused on the social aspects of medicine, but also continued to love the logic of mathematics. Haematology was a great match. Unlike other disciplines at the time, you could readily access blood cells; it wasn't like the liver, or the brain, where you couldn't look at primary material. You could ask clinically-important, physiologically-based questions in the laboratory, and you could apply logic and rigor to patient care decisions.

All of this was further inspired by a mentor who taught our second year class in medical school, Steve Robinson. He was a thoughtful individual, who also was both an excellent clinician and a lab-based investigator. I think we all have these role models, or inspiring individuals, who lead us down our path.

Q2 You served as President of the American Society of Hematology (ASH) in 2013. Where does this rank for you in your list of personal achievements, and how is the organisation 'helping haematologists conquer blood diseases worldwide'?

ASH is actually the best-run organisation I've ever touched, and it's quite inspiring. The best position in ASH is being on council, for the reason that you have 12 colleagues from different areas that you wouldn't normally know. Everyone works wonderfully together and ASH staff are spectacular at gathering all the information you need to make thoughtful decisions. You rapidly go from talking about something like the ethics of stem cell investigation, to how to highlight more basic science, to pay for performance, and how Medicare payments in the United States impact healthcare decision-making. It's just really fun.

My earlier contribution to ASH was leading the education programme. At that point, stem cells were becoming a hot topic, something that my own research had diverted in part towards. I suggested that there be a scientific committee on stem cells, and that was embraced. I led this committee for its first 3 years. The friends that you make through ASH commitments are longstanding, like college roommates or colleagues that you work with on your medicine residency or internship. They are people that you'll see over your career, infrequently, but you know them well, and trust interactions because you've worked closely together.

ASH deals with all sorts of issues, and as a leader, you deal with issues that you know all

about, and others that you don't know about at all. One example of an issue I didn't know about was how to construct a new building and finance it. I think the most exciting, unique issue that I dealt with was the inappropriateness of testing for sickle cell trait as a prerequisite for participation in college athletics. Interacting with the National Collegiate Athletic Association (NCAA) was a novel experience. I also interacted frequently with the European Hematology Association (EHA).

After you finish your President year, you are ignored; you are not even informed of the outcomes from your last meeting. It's very different than EHA, for example, that keeps an 'Immediate Past President' to guide incoming officers. However, this assures a very vibrant organisation, even though it's quite unsettling for someone who spent several intense years as an ASH leader. I've done occassional things for ASH since my presidency, the most recent with the President of EHA, Elizabeth McIntyre. We were co-leads of the Translational Research Training in Haematology (TRTH) program, an intense training opportunity for beginning faculty members or group leaders, along with very late postdoctoral fellows. The programme involves 20 scholars, 10 from Europe, and 10 from the USA. We spent time together, focused translational, laboratory-based research career development, with 14 other mentors, faculty members like the two of us. The intent is that the scholars will be successfully launched as haematology investigators, and that they also will collaborate with each other throughout their careers. We were the leaders during the COVID-19 pandemic, and so the 1-year programme became a 2-year programme, and then a 2-and-a-half-year programme by the time we conducted our final in-person meeting, as a result of COVID outbreak delays.

Q3 Looking back at your career and reflecting on your time in the field, where do you feel you gained the most valuable experience? Could you tell us about the Frederick Sheldon Traveling Fellowship you were granted by Harvard University?

The fellowship was certainly critical to my career decision-making. I spent time with physicians in the Congo, Papua New Guinea, Thailand, and India. It was unusual to travel then as a woman, and it predated all the travel resources we have now; I had to get information from other travelers en route. There were no travel books, no cell phones or phone connections, and mail was unreliable and took 6-8 weeks. This travel opened my eyes to an awful lot of social issues and international concerns that I hadn't thought about. I learned to understand different behaviors and adapt to different cultural norms without judgement, such as learning why a cassowary bird or banana leaf necklace is important in rural Papua New Guinea. We had no backup support and limited supplies, so physicians had to use anthropologic clues and physical examination to make a medical decisions. I didn't realise how much I was learning at the time, but this exposure to cultural diversity has been absolutely fundamental to how I think about care.

A nice thing about haematology is that patients rarely cause their haematologic problems; they just happen. You are not dealing with someone who smokes repetitively who then develops chronic pulmonary diseases. In haematology, there are causes and effects, but no fault.

Regarding my current practice, the University of Washington in Seattle is the only medical school for five states: Washington, Wyoming,

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Alaska, Montana, and Idaho. Thus, we care for patients across a quarter of the geographic area of the USA. However, it's nowhere near a quarter of the population of the USA. I think my prior experiences impact my current life, in terms of understanding people's priorities, and when, why, and how they access care.

Q4 What are the most significant changes you have observed in the field of blood disorders? Are there any innovative approaches you are particularly excited about on the horizon?

The explosion of genomics, other omics, and epigenetics is huge for blood diseases. In the clinical space, we are faced with important questions, from healthcare access and equity, to sequencing technology and producing personalised medications, to looking at cost efficacy and risk versus benefit, as well as exploring and developing new drugs and new approaches. Gene therapy, as an example, comes with many complexities. For example, in sickle cell disease this decision is challenging, as we have no good predictors of who's going to do badly until they're already starting to do badly. Gene therapy can have significant morbidities, and as a new method, can have unknown or unappreciated consequences, as well as a major positive impact.

Q5 The lab you lead at the University of Washington is investigating the interaction between haeme and globin during erythropoiesis. What are the key findings from this research to date?

I'm interested in how red cells grow and develop in the marrow, from early progenitors to mature fully-functional cells, and how this goes awry. In particular, my lab investigates ineffective erythropoiesis, that is when cells start to differentiate but die in the marrow, and never make it out. There are many diseases that are very different, or appear on the surface to be very different, but result in this common outcome. These include Diamond–Blackfan anaemia, which is an inherited problem; myelodysplastic syndrome, which is an acquired disorder; and deficiency of B12, a side effect from the use of extra medicines, like hydroxyurea, which is a treatment for sickle cell disease. They all have the same physiology downstream, whereby cells start to develop and then they die en route. My lab has shown that ineffective erythropoiesis develops when there is excessive haem inside differentiating red cells.

Over 95% of the protein content of a mature red cell is haemoglobin which is constructed by haem (a toxic chemical if free) combining with globin (a protein) in a precise fashion. The fundamental issue that we are looking at now in our lab is the molecular relationship of haem with globin as red cells mature.

Although it used to be very common, the unusual thing about what I do, and that not many people do now, is to be a practising doctor and a lab-based scientist. Now, people tend to focus their practice and do clinical trials or correlative research that connect. In my practice, I see patients with diverse blood disorders, including leukaemia, and I also teach medicine and hematology trainees. When you work in a lab, you learn how to be logical and rigorous in your approach to patient care; the two complement each other.