Hannah Hale

Hannah Hale graduated with a first-class Master's degree in Natural Sciences from the University of Cambridge, UK, which included an exchange year at MIT, Boston, USA. She specialized in Physics and Materials Science.

Hannah joined Siemens initially as an intern at Siemens Magnet Technology (SMT), Eynsham, UK. She then successfully applied to become a Magnet Engineer in the R&D team after her graduation in 2009. Over the years, Hannah has worked on a variety of projects within R&D. Highlights include developing SMT's conduction cooled test facility and leading the MgB_2 program. These are both key technical milestones in achieving helium-free magnets.

Oxford, UK

How did you first come into contact with MRI?
I applied for a scholarship scheme run by Siemens Magnet Technology (SMT) with the University of Cambridge. It sounded like a fascinating area of technology that I knew relatively little about, and I thought it would provide me with two summers of interesting employment. Little was I to know that this would be the beginning of a fulfilling career in MRI and superconducting magnet technology.

What is most fascinating about MRI?
Where to start? I know relatively little about the details of the software processing involved in descrambling all the RF signals into a meaningful image, so its very 'mystery' fascinates me. Equally my own area of expertise, the superconducting magnet, provides an abundance of fascination and interest. For starters, let's begin with the counterintuitive reality of superconductivity; provided the magnet is kept cold, it will stay at field indefinitely because current flows with zero resistance.

The contrasting scales in the superconducting magnet are incredible. Such a large, heavy object works successfully only as a result of the delicate balance between components inside. For example, a coil 1 mm out of position can make the difference between a great image or a scrambled mess. Additionally, the smallest of energy disturbances (µJ) – equivalent to dropping a drawing pin just a few centimeters from the floor – is sufficient to result in a magnet quench and loss of field. Every day I see and walk past our magnets knowing that all there is between me and temperatures akin to outer space (-269°C) are a few millimeters of stainless steel, a thin aluminum shield, and a few layers of multilayer insulation. Cool in both senses of the word!

A superconducting magnet contains a finely tuned blend of science and technology achieved through years of experience, research, and development. However, you'd be wrong to think that after ~30 years of this technology we'd be close to "understanding it all". Far from it. The final fascination is that there is still so much we don't fully understand. As we continue to push technology and process boundaries, we are learning more about the magnet at an ever-increasing rate.

What is your role in the development of MR magnets?
Today, I am a project manager leading an exciting and challenging project to bring revolutionary technology to the 3T product portfolio. I lead a cross-functional team with members from across the business, such as R&D engineers and SCM process engineers. We have to test and prove this magnet technology before managing its subsequent introduction into production. I see my role as the central hub of this project wheel, connecting everyone and working collaboratively to make informed and timely decisions, managing risk, and steering the project to maximize output for the effort put in. Simple, right?!

What for you are the most important developments in MR magnet technology or MRI in general?
In terms of magnet hardware, the biggest development will be the journey we are currently on; relinquishing the component's dependency on liquid helium. Liquid helium is required to keep the NbTi wire in the magnet superconducting at -269 °C. However, it is both an expensive and volatile resource. High-temperature superconductors will never be cheap enough for a viable MRI, so we are restricted to using the well-established low-temperature superconductor NbTi. With sophisticated designs, we are looking to reduce the need for liquid helium. In 2014 we demonstrated a prototype dry magnet which was cooled by a separate minimal volume of liquid helium. Minimal or even no helium would make MRI system installations much simpler and cheaper for the customer and come closer to the 'plug and play' utility.

As for the future developments at the system level, digitalization and artificial intelligence are really exiting avenues to explore. We need to adopt these technologies as they are going to be at the heart of the next revolution in healthcare provision: A one-stop shop for the patient with a hassle-free, streamlined, accurate, and reliable experience.

If you had one month to do whatever you wanted, what would you do?
Professionally, I would like to experience different areas of the entire MR value chain to gain a holistic understanding and appreciation. It is very easy to become so focused on your specific contribution to the product value chain (in my case, superconducting magnets) that you overlook the opportunities that link and relate to the product elsewhere. For me personally, I would also like an insight into other Siemens Healthineers businesses. I believe it is important to get out of our 'silos' because combined modalities and being able to offer the customer a single solution for all their needs is the way I see the market going. It would be a great opportunity to share knowledge and learn from others in the business. A month for all of this would barely scrape the surface though.

Being active outdoors is an important part of my personal life. I would love to have a month to go on a mountain expedition somewhere. My dream would be the Patagonian mountains if money were no object, but you don't have to go far to enjoy the wilderness. I've had some great trips with my husband in the Cairngorms, Scotland. I love the physical challenge, the outdoors, and exploring. I find it refreshing and rejuvenating. Being outside in the wilderness helps to put things in perspective, and the time away from the normal day-to-day routine gives me the opportunity for personal reflection.