



George Crabtree

Physicist and proponent of sustainable energy

By Humaira Taz

George Crabtree has been interested in the “why” from the beginning. Although he started his academic career in engineering during undergraduate studies at Northwestern University, he soon realized that he was more passionate about understanding why things are the way they are rather than how to get something to work. Shortly before graduation, he switched his focus to physics and continued to pursue this area as a master’s student at the University of Washington in Seattle. He later joined Argonne National Laboratory (ANL) as a laboratory technician and has been there ever since in a continuously evolving role.

George is now the director of the Joint Center for Energy Storage Research (JCESR) at ANL, director of the University of Illinois at Chicago (UIC) Energy Initiative, and distinguished professor of physics, electrical, and mechanical engineering at UIC.

During his early years at ANL, he realized he had to pursue a PhD in physics to do the fundamental research he wanted to do. His supervisor was supportive and worked out a program where George took night classes at UIC. “For me, it was always a curiosity question. We were studying transition metals whose electronic structures were not very well understood back in the 1970s. We found some of these materials to be superconducting, and I wanted to know why,” said George.

Are superconductors completely understood now? “The kind of superconductivity we had in the 1970s was based on the electron-phonon interaction and is now well understood. But then a new kind of superconductivity came along in the late 1980s with five times higher transition temperatures. The mechanism of this superconductivity in the copper oxide materials remains a scientific mystery.” George described that superconductors could have a major impact on sustainable energy. If you could replace the wiring in power transmission lines, motors, and generators with superconducting wires, you could improve the efficiency dramatically. In addition, you can save on materials cost, because to transmit the same amount of current through a superconducting wire, you would need less than a tenth of the amount of material. Superconducting cables are now being used to connect substations in Chicago, to allow them to share the load in the event one of them fails.

When asked if ANL has changed over the years, George said, “Back in the 70s, the research was very focused on fundamental science. Now the scope has expanded to include innovation in technology. Argonne and other national labs are encouraging startups to take the technology from lab to market.”

George manages to juggle his roles at ANL and UIC quite well. “I try to make both roles come together into a happy family,” George laughed. He enjoys serving as a faculty member so he can guide students early in the thought process. He and colleagues developed courses in sustainable energy, energy storage, and

autonomous vehicles to educate students on how these advancements could help solve real-world problems.

“Many parts of science policy were developed in earlier times, when technology was simpler. As technology advances, policy needs to be updated, too,” explained George. He advocated that students in STEM can enable this change by looking at the broader picture instead of focusing solely on the technical aspects.

“If you are too focused on the tech, then you cannot focus on the use ... and you need both. This is why I am a huge supporter of the startup culture. It advances not only new technology but also the policy that brings that new technology to society.”

George’s passion for sustainable energy prompted him to join JCESR even before it was funded by the US Department of Energy in 2012. The center involves 18 institutions with people from across the United States and at all levels of expertise. Their funding was recently renewed for another five years. “This is a big accomplishment for me, since this initiative enables the development of batteries and materials for batteries that will have a huge impact on energy storage in the world. Uber is thinking of air taxis, Amazon has plans for drone-based deliveries, and there are ideas for commercial flights that run on batteries!” exclaimed George.

How did he get involved with the Materials Research Society (MRS)? “That’s an interesting story. It was around the 2003 time frame when I was interested in renewable energy. DOE asked me to organize sessions in an energy workshop at an MRS conference. Although I was hesitant at first, I thoroughly enjoyed it. The intellectual content was high, and on top of that, MRS had represented a wide mix of interests focused on industry applications, technology, and the ‘how and where’ of the materials required for these technologies. This broad picture appealed to me, and I just continued my involvement,” said George. He has been on the *MRS Bulletin* Energy Quarterly Board since 2010 and the *MRS Energy & Sustainability* Editorial Board since 2013.

“Science is extremely powerful. As a discipline, all published work gets reviewed and verified, and it always moves in a positive direction. This is unusual for most disciplines. Therefore, pay attention to science—it has the ability to change the world for the better.” □

