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Oliver Kraft
2015 MRS President

Materials, innovation, and the quality of life

I would first like to thank you for allowing me the honor and privilege to serve this year as President of the Materials Research Society (MRS) and for being the second MRS President residing outside of the United States. I think this reflects the continuing evolution of MRS toward being a truly global Society since its beginnings more than 40 years ago. About half of our membership is based outside of the United States, and I am excited to see more and more MRS University Chapters popping up around the world. Since my first MRS Meeting that I attended back in 1991, I have always found MRS to be an open and welcoming Society, making every MRS Meeting a place to be. Building on our core values, I hope we can encourage more scientists and researchers from around the world to engage as volunteers with MRS to serve the global materials community. We face pressing challenges, like the reduction of CO₂ emissions and improving living conditions in many regions in Africa, to name just two. Peering through history's looking glass, I believe that materials science and engineering will continue to play a pivotal role in advancing humankind. From bronze smelting in ancient Egypt and Mesopotamia, to the development of industrial steel production and vulcanization of rubber in the 1800s, to *p*- and *n*-type silicon in 1936, material advancements have catalyzed societal changes and enabled improvements in the quality of life.

The 2014 Nobel Prize in Physics is a perfect example of the impact of materials research. Awarded to Isamu Akasaki of Meijo University and Nagoya University, Hiroshi Amano of Nagoya University, and Shuji Nakamura of the University of California–Santa Barbara, “for the invention of efficient blue light-emitting diodes, which has enabled bright and energy-saving white light sources,” it is truly a “materials” Nobel. The efficient blue LEDs required the development of GaN-based alloys with different compositions as well as their integration into multilayered structures such as heterojunctions and quantum wells. This is materials research at its best. People in the field who attended Shuji Nakamura’s 1994 MRS Spring Meeting talk where he first showed his prototype blue LED still remember with awe the dazzling light it gave off.

The current white LEDs taking over the world of lighting would not be possible without the invention of the blue LED. As the Nobel committee noted, about one-fourth of world electricity consumption is used for lighting purposes, and LEDs, which are rapidly replacing incandescent and fluorescent lighting, contribute to preserving materials resources. LEDs also last up to 100 times longer than incandescent bulbs. More importantly, LED lighting holds tremendous promise for increasing the quality of life for the 1.5 billion people around the world who still lack access to electricity. The low power requirement for LEDs means that they can be powered by inexpensive power sources. These aspects directly speak to the mission of MRS to improve the quality of life.



In a similar vein, the 2014 Nobel Prize in Chemistry was awarded to Eric Betzig of the Howard Hughes Medical Institute, Stefan W. Hell of the Max Planck Institute for Biophysical Chemistry, and William E. Moerner of Stanford University, for work on getting around Abbe's diffraction limit to allow for optical imaging at length scales in the tens of nanometers. "Microscopy has become nanoscopy," the Nobel committee stated. Microscopy is at the heart of materials science, and while the techniques developed have significant life sciences implications, the development of these super-resolution optical techniques using fluorescent molecules is also crucial in nanoscience, where materials science intersects with biology.

I look forward to continuing MRS's role in facilitating the exchange of information among materials researchers and communicating scientific breakthroughs by graduate students and Nobel Prize winners alike. I think that Ivan Amato summarized it well in his book *Stuff: The Materials the World Is Made of*, when he stated that MRS Meetings are "show-and-tell marathons in which researcher after researcher, in darkened hotel meeting halls, flashes annotated series of slides depicting exquisitely detailed data and images about a material's structure, functions, and place in the technological world. Many of these slide shows end up winning the attention of only a handful of like-minded specialists. . . . Some, however, take root and even grow into great branching subdisciplines. And some of these trigger research wildfires that change the world."

Materials will continue to change the world. And MRS will continue to provide forums for materials researchers to exchange ideas, fulfilling our mission to *promote communication for the advancement of interdisciplinary materials research and technology to improve the quality of life.*

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