Nobel Prizes for Super-Resolution Imaging

This year's Nobel Prize in Chemistry will be shared by three scientists who led to the super-resolution revolution by breaking the diffraction barrier in optical imaging.[1] As described last month, when he won the Kavli Prize in Nanoscience, Dr. Stefan Hell of the Max Planck Institute for Biophysical Chemistry at Göttingen proposed and developed super-resolution optical microscopy based on selective stimulated depletion of chromophores—stimulated emission depletion, or STED, microscopy.[2−4] Prof. W. E. Moerner of Stanford University developed the means to record the optical spectra and to control the emission of single molecules.[5,6] Dr. Eric Betzig of the Howard Hughes Medical Institute Janelia Research Campus used these ideas to develop a technique to measure and to assemble super-resolution fluorescence images—photoactivated localization microscopy, PALM.[7,8]

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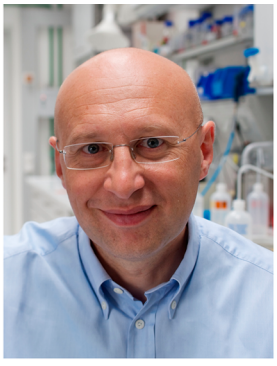

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The 2014 Nobel Prize Laureates in Chemistry are Dr. Eric Betzig, of the Howard Hughes Medical Institute at Janelia Farms, Dr. Stefan Hell of the Max Planck Institute for Biophysical Chemistry at Göttingen, and Prof. W. E. Moerner of Stanford University.

The laureates' work inspired and enabled many others to advance both imaging and their respective fields of science. We have been honored to present many of these advances as well as to lay out the continuing challenges and opportunities for super-resolution imaging.[9] Because they broke the diffraction limit, we can now explore with optical microscopy at scales that were previously only possible with scanning probes, electron microscopy, and the like. As visual creatures, we find these advances particularly satisfying. For more detailed descriptions of their work and some of the extraordinary subsequent developments that it inspired and motivated, please see a terrific review at the Nobel Prize Web site.[1]

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The Nobel Prize in Physics this year also relates to nanoscience, nanotechnology, and light. The physics laureates, Profs. Isamu Akasaki of Meijo University and Nagoya University, Hiroshi Amano of Nagoya University, and Shuji Nakamura of the University of California, Santa Barbara, developed blue light-emitting diodes (LEDs),[10] which "completed the spectrum" so as to enable usable energy-efficient lighting, displays, and others devices.

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It is exciting to see our field so honored. Please join us in congratulating the chemistry and physics laureates, their co-workers, and their colleagues.

Disclosure: Views expressed in this editorial are those of the author and not necessarily the views of the ACS.

Paul S. Weiss
Editor-in-Chief

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