The Nobel Prize in Chemistry 2014

The Royal Swedish Academy of Sciences has decided to award the Nobel Prize in Chemistry for 2014 to

Eric Betzig
Janelia Farm Research Campus, Howard Hughes Medical Institute, Ashburn, VA, USA.

Stefan W. Hell
Max Planck Institute for Biophysical Chemistry, Göttingen, and German Cancer Research Center, Heidelberg, Germany

William E. Moerner
Stanford University, Stanford, CA, USA

“for the development of super-resolved fluorescence microscopy”

Surpassing the limitations of the light microscope

For a long time optical microscopy was held back by a presumed limitation: that it would never obtain a better resolution than half the wavelength of light. Helped by fluorescent molecules the Nobel Laureates in Chemistry 2014 ingeniously circumvented this limitation. Their ground-breaking work has brought optical microscopy into the nanodimension.

In what has become known as nanoscopy, scientists visualize the pathways of individual molecules inside living cells. They can see how molecules create synapses between nerve cells in the brain; they can track proteins involved in Parkinson’s, Alzheimer’s and Huntington’s diseases as they aggregate; they follow individual proteins in fertilized eggs as these divide into embryos.

It was all but obvious that scientists should ever be able to study living cells in the tiniest molecular detail. In 1873, the microscopist Ernst Abbe stipulated a physical limit for the maximum resolution of traditional optical microscopy: it could never become better than 0.2 micrometres.

Eric Betzig and William Moerner, working separately, laid the foundation for the second method, single-molecule microscopy. The method relies upon the possibility to turn the fluorescence of individual molecules on and off. Scientists image the same area multiple times, letting just a few interspersed molecules glow each time. Superimposing these images yields a dense super-image resolved at the nanolevel. In 2006 Eric Betzig utilized this method for the first time.

Today, nanoscopy is used world-wide and new knowledge of greatest benefit to mankind is produced on a daily basis.

Prize amount: SEK 8 million, to be shared equally between the Laureates.

Further information: http://kva.se and http://nobelprize.org

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This year marks the 275th anniversary of The Royal Swedish Academy of Sciences. The Academy was founded in 1739 and is an independent organization whose overall objective is to promote the sciences and strengthen their influence in society. The Academy takes special responsibility for the natural sciences and mathematics, but endeavours to promote the exchange of ideas between various disciplines.