Stiftung
Werner-von-Siemens-Ring

PRESS RELEASE, 31 JANUARY 2022

The 2022 Werner von Siemens Ring goes to the BioNTech quartet and to super-resolution microscopy pioneer Stefan Hell

The Werner von Siemens Ring Foundation is this year simultaneously honoring two groundbreaking technical achievements. With their successful fundamental research into mRNA therapies, the scientists at the biotechnology company BioNTech – Uğur Şahin, Özlem Türeci, Christoph Huber and Katalin Karikó – have ushered in a new age of medicine. The award is also being bestowed on Stefan Hell, physicist and Nobel laureate, for his molecular-level observations of living cells using a novel technology known as super-resolution microscopy. Being able to peer into the molecular clockwork opens the door to a wide range of new discoveries for researchers in the life and material sciences. The vote taken by the highly renowned members of the foundation's board was clear: For these outstanding achievements, the BioNTech team and Stefan Hell will receive the Werner von Siemens Ring at ceremonies to be held in December 2022 in Berlin.

The mRNA technology is a game-changing milestone in the fields of cancer research and coronavirus vaccines and it marks the launch of a new era of medical practice

Uğur Şahin, Özlem Türeci, Christoph Huber and Katalin Karikó (top left to bottom right) will together receive the Werner von Siemens Ring in December in Berlin for their groundbreaking work in the technical sciences.

They are probably Germany's best known scientists today: BioNTech chief officers Prof. Dr. med. Uğur Şahin and Prof. Dr. med. Özlem Türeci. The two met at the Saarland University Hospital, where they collaborated in the development of a procedure for identifying human cancer antigens that are relevant to immunotherapy, a procedure that would find application around the world. In 2000/2001, Christoph Huber, then Director of the Medical Center of the Johannes Gutenberg University in Mainz and internationally renowned expert in the fields of antitumor defense, oncology and stem cell transplantation, recruited the two highly talented scientists and brought them to Mainz, where he has since been their mentor.

In addition to their outstanding research talents, Uğur Şahin, Özlem Türeci and Christoph Huber also share the entrepreneurial drive to advance the development of medicines. In 2001, they founded Ganymed Pharmaceuticals, which specialized in the development of monoclonal antibodies for the treatment of tumor diseases, and which attracted much international attention when it was sold to Astellas Pharma Inc. in 2016. The clinical study with the antibody developed by Şahin, Türeci and Huber is currently in Phase 3 trials, the final phase before possibly seeking approval as a pharmaceutical product. The BioNTech company was launched by the three researchers in 2008 with the aim of advancing the complex mRNA technology to the stage where it could be applied in the treatment of various diseases.

Uğur Şahin and Özlem Türeci made a series of trailblazing discoveries that paved the way for dramatic improvements in the immunogenicity of mRNA vaccines. The advances attained by Şahin and Türeci meant that for the first time only tiny quantities of mRNA would be sufficient to effectively stimulate the immune system to fight off tumors and infections. Their work served to overcome the low activity levels that represented one of the primary drawbacks of mRNA vaccines.

Stiftung Werner-von-Siemens-Ring • Steinplatz 1 • 10623 Berlin
T +49 30 310078 155 • F +49 30 310078 225
kontakt@siemens-ring.de • www.siemens-ring.de

HypoVereinsbank • BIC HYVEDEMM414
IBAN DE 16 3022 0190 0364 0652 05
Stiftungsregister Berlin AZ 3416/208-II.2

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In 2013, another of the world's few mRNA researchers, biologist Prof. Katalin Karikó, Ph.D., joined the BioNTech team as Senior Vice President. She succeeded in successfully clearing a further hurdle on the path to mRNA application. By modifying RNA molecules to make them less immunostimulatory and more tolerable, she made it possible to increase the quantities in which they could be administered.

In early 2020, at the outset of the coronavirus pandemic, Uğur Şahin and Özlem Türeci quickly realized that the mRNA technology originally developed to treat cancer could also serve as a platform for the development of a pandemic vaccine. The scientific expertise that had been accumulated at BioNTech over the years, coupled with the entrepreneurial foresight of the company's founders, made it possible to develop and clinically test a new vaccine in less than a year.

The mRNA technology opens enormous development prospects not only for the prevention and treatment of viral diseases but also for treating cancer and autoimmune diseases, inducing tolerance to allergens, or treating hereditary diseases. Having now made the successful transition from theory to application, the mRNA technology has catapulted the world into a new era of medical practice. “Through their many years of fundamental mRNA research and with their bold entrepreneurial spirit, Uğur Şahin, Özlem Türeci, Christoph Huber and Katalin Karikó have given humanity a new class of drug that harbors enormous potential,” says Prof. Dr. Joachim Ullrich, President of the Physikalisch-Technische Bundesanstalt (PTB) and President of the Werner von Siemens Ring Foundation Board. “For this work they are jointly awarded the Werner von Siemens Ring.”

Super-resolution microscopy – an incredible look into the molecular details of the living world

For his life's work in the technical sciences, Stefan Hell will be awarded the Werner von Siemens Ring this December in Berlin.

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Prof. Dr. Dr. Stefan W. Hell is the pioneer behind super-resolution fluorescence microscopy. With the development of the super-resolution STED microscope in the 1990s, he became the first to demonstrate that the diffraction of light, which until then had represented an unsurpassable limit to the resolution attainable by light microscopy, could be completely bypassed. He is currently a Director at both the Max Planck Institute for Multidisciplinary Sciences (formerly the Max Planck Institute for Biophysical Chemistry) in Göttingen and the Max Planck Institute Medical Research in Heidelberg.

The stimulated emission depletion (STED) microscope developed by Stefan Hell is able to reveal biological structures at resolutions previously considered physically impossible in light microscopy. The STED microscope can be used, for example, to observe how nanoscale proteins are arranged in a cell and how they act upon one another. This enables scientists to better understand the molecular mechanisms behind diseases such as Alzheimer's, Parkinson's or cancer. His fluorescence microscope further allows the dynamic changes that occur to neuronal structures in the brain, for example during learning processes, to be observed with much greater accuracy. In 2016, Stefan Hell successfully made another quantum leap in the field of super-resolution microscopy. The MINFLUX technique, which utilizes a switchable fluorescent dye to label molecules, has for the first time made it possible to achieve a resolution of just a few nanometers, surpassing the old “unsurpassable” diffraction barrier by a factor of one hundred. Today, both this technique and the evolved MINSTED method go even farther and can achieve a resolution limit down to the molecular scale of one nanometer. Now, even the most minuscule processes of life that take place on our complex planet can be visualized at the molecular level using the fluorescence microscopy techniques developed by Stefan Hell.

Besides his groundbreaking achievements in microscopy, Stefan Hell has also succeeded in making the techniques he developed available for practical applications. Together with Dr. Gerald Donnert, a former colleague, Stefan Hell

initiated the founding of the Abberior group of companies. The close proximity between the researchers at the Max Planck Institute for Multidisciplinary Sciences and those at Abberior allow the company to quickly translate the findings of fundamental research into technological innovations. It took less than four years for the MINFLUX technique to move from first scientific publication to market launch.

“Stefan Hell unites, in exemplary manner, the scientific excellence and strong innovative drive needed to develop new technologies,“ notes Foundation Board President Prof. Dr. Joachim Ullrich. “The various high-performance super-resolution microscopes and fluorescent labels that are now available to all scientists represent a huge breakthrough for optical microscopy. They enable, for instance, the molecular-scale visualization of the structure and function of synapses in the nervous system and of cell membrane composition and dynamics. These techniques promise to deliver exciting discoveries and insights in the life sciences and material sciences. With the bestowal of the Werner von Siemens Ring, we pay honor to Stefan Hell's outstanding lifetime achievement in the technical sciences.“

About the Werner von Siemens Ring Foundation

Honoring lifetime achievements in the technical and natural sciences and fostering current technological research are the declared objectives of the Werner von Siemens Ring Foundation. For over a century, the Werner von Siemens Ring and the ring honorees have served as beacons and sources of motivation for generation after generation of researchers in the technical and natural sciences. The Foundation's work relies on the dedication and commitment of its Board members, which include both ring bearers and high-ranking representatives of the following technical and scientific organizations: the *Physikalisch-Technische Bundesanstalt* (PTB), the *Deutsche Forschungsgemeinschaft*, the *Fraunhofer Gesellschaft*, the *Max Planck Society*, the *Stifterverband für die Deutsche Wissenschaft*, the *Federation of German Industries*, and the *Deutscher Verband Technisch-Wissenschaftlicher Vereine*. The Werner von Siemens Ring is Germany's premiere prize for honoring individuals whose achievements have significantly advanced the technical sciences or whose research has opened up new avenues of technical progress. The Werner von Siemens Ring has been awarded since 1916.

Media contacts

The Werner von Siemens Ring Foundation | E-Mail: presse@siemens-ring.de