The Second Awarding of The Heinrich Rohrer Medals

February 4, 2017

The Surface Science Society of Japan (SSSJ)

It is our great pleasure to announce the winners of the second awarding of The Heinrich Rohrer Medals. The Medal was established after the name of Late Dr. Heinrich Rohrer, one of the Laureates of Nobel Prize in Physics in 1986, for recognizing researchers who have made the world-top level achievements in the fields of nanoscience and nanotechnology.

The 2nd Heinrich Rohrer Medal -Grand Medal-

- **Joseph A. Stroscio**

National Institute of Standard Technology (NIST), U.S.A.

"For his pioneering achievements on spectroscopic capability of scanning tunneling microscopy opening novel perspectives for revealing the quantum nature of the nano-world"

The 2nd Heinrich Rohrer Medal -Rising Medal-

- **Sascha Schäfer** (born in 1980)

University of Göttingen, Germany

"For his outstanding contributions to the development and application of ultrafast electron microscopy and diffraction"

The 2nd Heinrich Rohrer Medal -Rising Medal-

- **Alfred J. Weymouth** (born in 1980)

University of Regensburg, Germany

"For his valuable contributions to force microscopy at the atomic scale including studying the interplay of current and force, applications of lateral force microscopy, and imaging in ambient conditions"

Award Ceremony

The award ceremony will be held at The 8th International Symposium on Surface Science, ISSS-8 (http://www.sssj.org/isss8/), on October 22-26, 2017, at Epochal Tsukuba, Tsukuba, Ibaraki, Japan, which is organized by The Surface Science Society of Japan. The awarding will be in collaboration with Swiss Embassy in Japan. The laureates will deliver the award lectures on their research achievements during ISSS-8.

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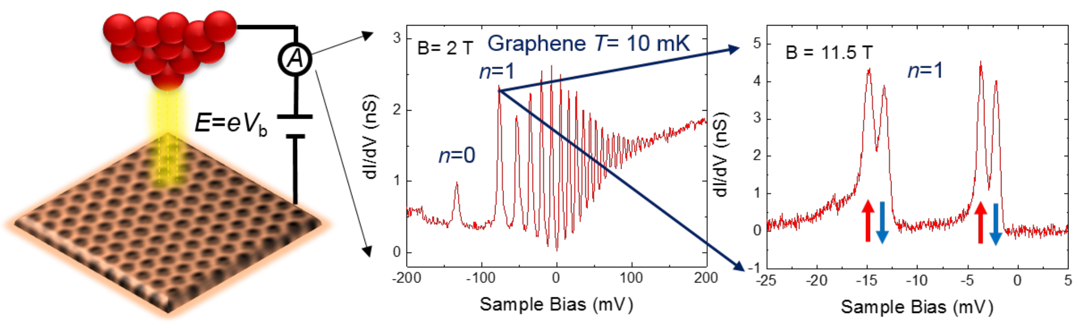
Award Achievements
The 2nd Heinrich Rohrer Medal –Grand Medal–
Dr. Joseph A. Stroscio

"For his pioneering achievements on spectroscopic capability of scanning tunneling microscopy opening novel perspectives for revealing the quantum nature of the nano-world"

Dr. Stroscio has been a leading scientist in surface/nano science field throughout his career. His major contribution is the first successful measurement of scanning tunneling spectroscopy (STS). Dr. Stroscio together with Dr. Feenstra showed that the local density of state at a site of interest in addition to surface structures could be measured by taking the first voltage derivative of the tunneling current. This idea could not be realized unless they added an extra feedback circuit to nullify a thermal drift of STM at room temperature. STM thus became a tool with combined power of transmission electron microscope and photoemission spectroscopy with an atomic resolution. He was the first person who showed a local electronic structural map of Si(001)-2×1, revealing the surface bandgap and a π-bond nature of Si dimers. He demonstrated the chemical identification of Ga and As atoms on a GaAs(110) surface, and identified various gap states and their electronic influence to GaAs surfaces.

Stroscio's other landmark contributions to surface/nanoscience involved manipulation of atoms with the scanning tunneling probe. This finding ushered in an unparalleled era of discovery about the nanoworld. His passion in advancing instrumentation led to the design and construction of STMs operating at milli-Kelvin temperatures, dramatically improving the energy resolution down to tens of μeV. With these systems he succeeded in unveiling the quantum mechanically degenerate energy states in graphene and topological insulators.

With his great contributions in STS, atom manipulation, and ultra-high energy resolution STM, scanning tunneling microscopy/atomic force microscopy have become the most important structural and spectroscopic tools with atomic resolution and μeV energy resolution, leading to many new scientific discoveries in surface science and nanotechnology.



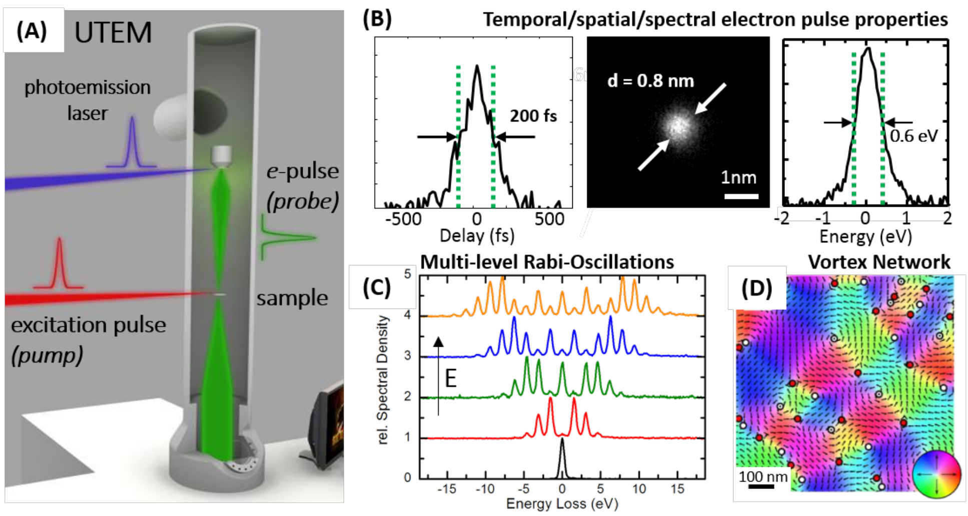
Award Achievements
The 2nd Heinrich Rohrer Medal –Rising Medal–
Dr. Sascha Schäfer

"For his outstanding contributions to the development and application of ultrafast electron microscopy and diffraction".

Dr. Schäfer has made widely recognized contributions to the development and application of ultrafast transmission electron microscopy (Ultrafast TEM) and diffraction based on highly coherent electron sources. In ultrafast TEM, the transient state of an optically excited sample is imaged by ultrashort electron pulses. This approach combines the femtosecond temporal resolution of ultrafast pump-probe techniques with the nanometer spatial resolution of electron microscopy. The use of nanoscale electron sources in time-resolved electron microscopy can be considered a breakthrough in this field.

His work has now made it possible to conduct electron diffraction experiments with a few nanometer spatial and 200-fs temporal resolution. Although the full implications of this work in the dynamical study of structure and magnetization would continue to evolve in the near future, the Ultrafast TEM even at the first stage has already opened up completely new possibilities in terms of manipulating electron beams in a quantum coherent manner. These works have created a new link between quantum optics and electron microscopy, and they are expected to lead to electron microscopy with attosecond precision in the future. By his intense involvement in the conceptual and experimental realization of the Ultrafast TEM, Schäfer has played a key role in making these works possible. He also made a major contribution to the first ultrafast low-energy electron diffraction (ULEED) experiment, which has enabled the study of the dynamics of a polymer monolayer on top of freestanding graphene.

Demonstrating his broad scientific scope, Schäfer has recently directed a study on the creation of a completely new and unexpected type of magnetic texture composed of a network of topological defects in a ferromagnetic thin film.



Award Achievements
The Heinrich Rohrer Medal –Rising Medal–
Dr. Alfred J. Weymouth

"For his valuable contributions to force microscopy at the atomic scale including studying the interplay of current and force, applications of lateral force microscopy, and imaging in ambient conditions"

Dr. Weymouth made several significant contributions in the field of non-contact atomic force microscopy (nc-AFM). An important aspect of his work was the discovery of the so-called "phantom force". It is the influence of a tunneling current on the force on the AFM tip, which occurs on surfaces with relatively small conductivity. The current flow in the sample leads to a potential drop, affecting the electrostatic force sensitively measured by nc-AFM. While the atoms on a surface can appear repulsive due to the phantom force by applying the bias voltage (region I, bumps in the nc-AFM image), the expected attractive contrast be found when the tip come closer to the sample without bias voltage (region III, depressions in the nc-AFM image).

He had also applied lateral force microscopy to outstanding problems. One example is the characterization of a CO terminated tip, now used as a standard probe in nc-AFM experiments at low temperature, capable of resolving the internal structure of adsorbed organic molecules. The bending of the CO plays an essential role in enhancing the spatial resolution. Weymouth measured the interaction of a CO molecule attached to the tip apex with another CO molecule adsorbed on a Cu surface. He determined the lateral stiffness of the CO molecule on the tip and clarified that the value is less than that of a molecule on the surface. This knowledge is now standard in the field of Atomic Force Microscopy.

A third contribution is his work advancing nc-AFM in ambient conditions. The ability to image individual atoms in this environment paves the way for its future use not only in Surface Science but also in other scientific branches such as Chemistry and Biology.