

With this years Nobel Prize a life achievement and a person is honored, who has, like nobody else, influenced surface science from its beginning until today. Gerhard Ertl, emeritus scientific member and director at the Fritz-Haber-Institut of the Max-Planck Society in Berlin, Germany, the scientific great grand son of the founding director, whose name the institute carries, has received notice of the “ultimate award” on the occasion of his 71. Birthday, October 10th 2007. The occasion was celebrated by his collaborators, colleagues, friends, and students and a whole squadron of journalists.

The Nobel Prize before these years that went to the FHI was given to Ernst Ruska, the inventor of electron microscopy in 1986. During the almost 100 years history of the institute few more Nobel laureates worked here: Fritz Haber, James Franck, Otto Hahn and Max von Laue. There is a scientific genealogy at the institute connected with this year’s laureate: Gerhard Ertl’s thesis advisor was Heinz Gerischer, a prominent electrochemist, and a former director of the institute. Gerischer was a student of Karl Friedrich Bonhoeffer who headed the institute in the post world war II period, who himself was a Fritz Haber student. There is also a scientific loop closing with Gerhard Ertl’s Nobel Prize: Fritz Haber had discovered the process to make ammonia from the nitrogen in the air in 1905 – 1908, which was then commercialized by Bosch within BASF. Haber received the Nobel Prize in 1918 accompanied by the remark that with his discovery he had saved Europe from starvation.

The following more than fifty years were determined by attempts to explain the mechanism of splitting one of the strongest known bonds between two nitrogen atoms via interaction with the surface of an iron based catalyst. Only in 1975, Paul Emmett, himself an eminent physicochemist, wrote: “The experimental work of the past 50 years leads to the conclusion that the rate determining step in ammonia synthesis is the chemisorption of nitrogen. The question, however, as to whether the nitrogen species is molecular or atomic, is still not conclusively resolved”.

Shortly after, Gerhard Ertl and his group having had applied the methodology of surface science elegantly showed that the species that is hydrogenated stepwise to ammonia is atomic nitrogen. Those experiments documented elegantly Gerhard Ertl's ability to capture the essence of a complex process and condense it into a "simple" experiment. The mystery of the mechanism of ammonia synthesis was disclosed 70 years after Haber's discovery.

The search to understand the atomic structure and the dynamics of solid surfaces under the influence of adsorbates (often molecules from the gasphase) dominated Gerhard Ertl's research efforts. He has always developed or adapted new analytical tools as they became available and in an ingenious way combined them to extract "physically exact" results. The reaction studied most in Gerhard Ertl's group was CO oxidation on precious metal surfaces. Already in 1982 the group reported on Kinetic oscillations in CO₂ production during the CO-oxidation reaction on metallic single crystal surfaces, a phenomenon observed before only within technical chemical reactors.

Within a series of groundbreaking publications Gerhard Ertl's group demonstrated the connection between adsorption of carbon-monoxide and oxygen and the reconstruction of the surface. The reaction and the higher sticking probability on the non-reconstructed surface lead to a switching between reconstructed and non-reconstructed surface and thus to kinetic oscillation. Such oscillation can be regular, irregular or even chaotic. They represent the integral behaviors of the system. However, it is known from the Belousov-Zhabotinsky-reactions, that oscillations exhibit a spatio-temporal behavior. Gerhard's group developed a photoelectron microscope to image spatio-temporal structures such as spirals, chemical waves etc on solid surfaces for the first time. Together with theorists the group also developed an understanding of these non-linear dynamic phenomena.

It is near near at hand not only to look at the atomic dimension at surfaces in space but to also try to approach highest solution in time. Gerhard Ertl established a group dealing with "pump-

probe” experiments employing laser spectroscopy at femtosecond time resolution. Such experiments have led to new insights into electron dynamics and energy transfer processes at solid surfaces. Another excellent example for a new “old” technique in adsorption to the substantial electrochemical activities, pushed forward in Gerhard Ertl’s group is tip enhanced Raman spectroscopy. There are clear recent indications that it is possible to reach the single molecule limit, which opens a lot of possibilities in many areas of physical chemistry and surface science.

There are many other aspects worth mentioning in Gerhard Ertl’s achievement, but his oeuvre is simply too large to be more than just briefly highlighted in this short address.

He has published about 700 papers, several books and held several hundred invited talks. A full compilation of his activities until 2004, the year of his retirement, can be found in a “Festschrift” on the occasion of his 68th Birthday („Journal of Physical Chemistry B“, 108, 14183-14788 (2004)). The list of awards is very long and it is impossible to address them all: Liebig-Medal of the GdCH, Japan Price, Wolf Price etc. etc. About 40 named lectureships and an enormous effort to help the scientific community testify the appreciation and the trust we all have in him. And now the long overdue honor!

Gerhard is still very active. He is writing a book after he just held the Baker lecture at Cornell. The second edition of the “Handbook of Heterogeneous Catalysis” is heard to be almost completed and so it goes on He and his wife Barbara enjoy music with him playing the piano when Barbara’s choir rehearsals. They also enjoy their grand children as well as their second home in Bavaria apart from the one in Berlin.

The surface science community and all members of the board of *Surface Science Reports* - which he had been a member of for many years - are happy with him.

Congratulations!