

# Highlights of the Science and Life of Peter Varga (1946–2018)

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Peter Varga has passed on October 27, 2018. His pioneering discoveries of chemical resolution at the atomic scale on surface alloys, atomic resolution of ultrathin alkali halides, nucleation of bcc iron in ultrathin films, and the microscopic structure of ultrathin alumina films stimulated worldwide research. In recognition of his outstanding scientific contributions, in December 2017 the Japanese Society for the Promotion of Science (JSPS) awarded him a prize for his distinguished contribution on the clarification of surface phenomena by atomic level investigations and the development of novel functional materials. This contribution highlights the life of Peter Varga as a scientist and as a person. With his elegance, his energy, his wit, and his generosity he was a close friend and role model to many of us, and showed us how to combine scientific curiosity and creativity with the lightness of being.



**Keywords** Peter Varga; TU Wien; Scanning tunneling microscopy; Chemical resolution

## I. LIFE OF PETER VARGA

Peter Varga was born on June 30, 1946 in Vienna, Austria. He studied engineering physics at the TU Wien (Vienna University of Technology) in Vienna, Austria and started his lifelong career at the Institute of Applied Physics (IAP) as an undergraduate research assistant in 1973. He completed his masters thesis in 1974 supervised by Prof. Franz Viehböck, and received his PhD at the TU Wien in 1978 under the guidance of Prof. Hannspeter Winter.

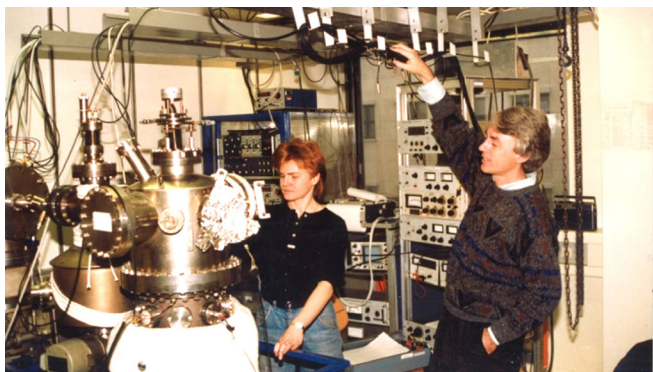
Already his early scientific work was recognized with several awards, including the Theodor Körner Prize (1980) and the Max-Auwärter-Prize (1981). An Alexander-von-Humboldt Fellowship supported post-doctoral research at the Max-Planck-Institute in Garching, Germany (1981–1982). Except for extended research stays abroad (1984 in Grenoble, France and 1985 in Osnabrück, Germany), he continued his career as a faculty member at the IAP in Vienna; first as an assistant professor and since 1997 as an associate professor and the head of the surface science group at IAP.

In 2011—at the in Austria mandatory retirement age of

65—Peter Varga retired from his position at TU Wien, but not from science. He continued providing valuable input as ‘Post-Prof’ in the surface physics group now led by Ulrike Diebold, and he helped to propel the newly-founded research center CEITEC in Brno to a high scientific level. Peter Varga passed away on October 27, 2018.



**Figure 1:** Peter Varga (30.06.1946–27.10.2018)



**Figure 2:** Peter Varga (right) and Ulrike Diebold (left) working on ion stimulated desorption from alkali halide surfaces in the late 1980s.

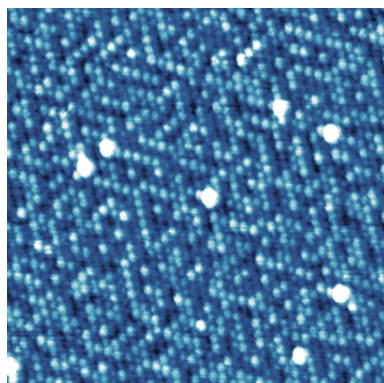
## II. PETER VARGA'S PERSONALITY & MAIN SCIENTIFIC ACHIEVEMENTS

Peter Varga was deeply invested in TU Wien and in the IAP. He was a major force in shaping the IAP into one of the world's leading centers in surface physics. Peter had a knack for identifying important scientific questions and figuring out how to best tackle them.

In the early 1980s he started investigating single crystal surfaces. He completed his habilitation thesis on ion-surface interactions in 1990, and used his expertise in low-energy ion scattering to investigate segregation phenomena in metal alloys [1].

His work (Figure 2) on the influence of the charge state on ion-surface interactions [2] laid the foundation for the successful research direction on highly charged ions that continues at IAP until today in the research group of Friedrich Aumayr.

Under the leadership of Peter Varga, scanning tunneling microscopy was established at IAP at a rather early stage. Together with Michael Schmid he has used this method for



**Figure 3:** First scanning tunneling microscopy (STM) study which allowed a clear discrimination of two chemical species in a metal alloy (adapted from Ref. 3).



**Figure 4:** Peter Varga (left), Ulrike Diebold (middle), and Fritz Aumayr (right) organizing the 3S\*14 Symposium on Surface Science in St. Christoph am Arlberg, Austria in March 2014.

groundbreaking surface investigations. Their atomically resolved scanning tunneling microscopy images of densely packed platinum-nickel alloys (Figure 3) are a legendary first [3].

They established ultra-thin sodium chloride films on aluminum as an ideal and subsequently intensively- used system to support and electronically decouple atomic and molecular adsorbates from a metallic substrate [4].

The outstanding performance of the instrument at IAP has led to many fruitful collaborations with groups from all over the world. Early on Peter Varga recognized the importance of combining theory and experiment in surface science, and used it successfully for the interpretation of experimental results. This led to outstanding results, particularly in the area of ultrathin oxide films [5]; today oxide surfaces are the main research focus of the Surface Physics group at IAP, now led by Ulrike Diebold.

His scientific work, creative yet meticulously executed, often resolved heated scientific controversies: particularly important was the structure determination of ultra-thin iron films on copper [6]. This system fascinated Peter up to the end: in his last Austrian National Science project (FWF), completed in July 2018, his ultra-thin paramagnetic iron-nickel films are used for fabricating magnonic nanostructures together with colleagues at CEITEC Brno [7].

Peter was deeply committed to his students and an effective research advisor to numerous Bachelor, Masters and PhD students. It is here that his high social intelligence, his deep understanding of, and concern for people came to bear most clearly. He was respected and loved, and many graduates of his group have gone on to become influential leaders in industry and academia.

Peter also distinguished himself through his service to the international scientific community. Through the organization of workshops (Figure 4), symposia and congresses (including one of the most prominent conferences in surface phys-



**Figure 5:** Peter Varga receiving the Award of the 141st Committee on Microbeam Analysis of the Japanese Society for the Promotion of Sciences (JSPS) from Prof. Yoshikazu Homma (Tokyo University of Science) at the ALC'17 meeting in Kauai, Hawaii.

ics, the European Conference on Surface Science in Vienna 1999), his many years of service in the Austrian Vacuum Society (ÖGV President 1997–2001), and IUVESTA, the International Union of Vacuum Science and Technology, he helped the IAP gaining its international reputation.

For his scientific achievements Peter Varga received numerous recognitions. Amongst others he was awarded an honorary doctorate of the University of Lund in 2010. At the Atomic Level Characterization Conference 2017 (ALC '17) in Kauai, Hawaii, USA, the Japanese Society for the Promotion of Science (JSPS) awarded him a prize for "... his distinguished contribution on the clarification of surface phenomena by atomic level investigation and the development of novel functional materials ...” (see Figure 5).

Peter was a brilliant physicist. But most of all he was a great man and a real friend to many. He lived his life to the fullest. He was known for saying it like it is. With his sharp



**Figure 6:** Peter Varga at the 13th International Workshop on Inelastic Ion-Surface Collisions in San Carlos de Bariloche, Argentina on 20 Nov. 2000.



**Figure 7:** Peter Varga enjoying skiing "off-piste" in the Arlberg mountain region of Austria during 3S\*10.

and incisive humour he got right to the point. Perhaps his personality is best reflected in the 3S symposium series (the abbreviation 3S stands for Symposium on Surface Science), which he founded and chaired: For more than 30 years, the who's who of surface science has gathered every winter for a week of excellent science, energetic skiing and exuberant sociability (Figures 4 and 6). Most of all he was a wonderful human being. With his elegance, his energy, his wit, and his generosity he was a close friend and a role model to many others.

Peter Varga showed us how to combine the quest for scientific knowledge with joie de vivre (Figure 7) and a genuine interest in people. He embodied the lightness of being. For this he will be missed by many.

### Acknowledgments

Peter Varga felt indebted to the Austrian Science Fund (FWF) for support of his many research projects.

### Appendix

A video message entitled "In memoriam Peter Varga: his legacy in the world of surface science, viewed from his home town Vienna in Austria", which was produced by two of the authors (U. D. and F. A.) as a contribution to the Peter Varga Memorial Session which took place at the ALC '19 conference in Kyoto on 24 October, 2019, is available in Supplementary Material at <https://doi.org/10.1380/ejssnt/2020.8>.

### Note

This memorial was presented at the 12th International Symposium on Atomic Level Characterizations for New Materials and Devices '19 (ALC '19), in conjunction with the 22nd International Conference on Secondary Ion Mass Spectrometry (SIMS-22), Miyako Messe, Kyoto, Japan, 20–25 October, 2019.

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