

In Memory of Georg Wahl

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I worked under the leadership of Professor Dr. Georg Wahl from 1996 to 2005, during several periods. Our relationship, though, stretched beyond that time period and much farther than the scientific scope of my work. In both cases it was due to the unusually attractive personality of Georg Wahl.

My professional carrier commenced in the early 90's with research in chemical vapor deposition (CVD), and at that time, Georg Wahl was one of the major experts in CVD worldwide. When I became acquainted with him, he led the Institute for plasma and surface technology research (IOPW) in Braunschweig, having had a successful industrial career previously with ASEA Brown Boveri in Heidelberg.

Braunschweig is a medieval town centrally located in north Germany close to fairytale-driven region of the Harz mountains. Professor Wahl lived in his house in Wolfenbüttel – another medieval jewel with the Herzog August library founded in 1572. Bibliotheca Augusta once was a working place of Leibnitz and Lessing. Giacomo Casanova wrote about it: "I spent eight days in the library, and I didn't leave other than to eat and sleep in my room. I lived there completely happy, didn't think either of the past or the future, and my spirit, which was totally sunk into my work, didn't realize the present", The princess Charlotte Christine, born in Wolfenbüttel in 1695, was married to Alexey, a son of the famous Russian Tzar Peter the Great, and gave birth to Peter the Second, who ruled Russia from 1827 to his untimely death in 1830. Many of those stories I first heard from Georg Wahl. I don't remember all of them, but what I remember exactly was my pure joy while listening, since Georg Wahl was an exceptional storyteller. It was not about the knowledge of an enormous amount of historical, cultural and technical facts, but rather an ability to use that knowledge in a way of noticing the unusual in the

common. It was never boring, with just the right amount of humor. I think it is that abilities that makes a good storyteller. Those things played a significant role in our everyday communication. It was fun, and filled life with good emotions and feelings.

The scientific group in Moscow State University around Professor Andrey Kaul had established a collaboration with the group led by Professor Georg Wahl around 1990. More than 30 joint articles were written during those 20 years or so of collaboration. In 1996, I became a part of this bilateral research effort, coming to Germany for a six-week stay. I had just graduated from the Chemistry Department of Moscow State University and was full of enthusiasm to continue my work on CVD of high temperature superconductors (HTS). My more senior colleagues built an experimental CVD setup in IOPW, and I continued the experiments. IOPW at that time was finely equipped with a scanning electron microscope and a 4-circle X-ray diffractometer; it was pretty much everything one needed for good research in thin film area. I was lucky enough to come just at the right time.

A couple of days after my arrival there was an IOPW-party on the Saturday, organized by the employees. We had a bicycle tour to a small town near to Braunschweig, where we had a cooking team event of selected delicious plates in a castle tower followed by dinner together at a round table placed in the middle of the tower. As you probably can imagine, it was a perfect team-building opportunity with a lot of positive feelings. Georg Wahl was leading the many discussions we had that day, demonstrating the solid character of a team leader, and a mentor to much younger professionals like me. Several times after that, when we visited other places, when he invited me to some concert event with his family or to visit his house, I felt his encouraging mentoring. I am most grateful for that, for it helped me a lot in my life.

I did not speak German at that time. As for many researchers today, using only English is not a problem at all, but my stay in IOPW was so full of impressions that after coming back to Moscow I started to learn German. It felt to

me very worthwhile to be involved and I decided not to miss the opportunity. In that context it should be mentioned that Georg Wahl knew the Russian language well enough to read classical and professional literature. In his letters that he wrote to me over his last years he mentioned that his interests had shifted to music (he played flute and sang in chirs) and languages (“so I don’t forget Russian!”) even more. One of his stories gels well with all of that; thanks to email, it did not escape my memory. Georg Wahl was reading a book on Russian scientists and there was a story about the famous mathematician Lobachevsky, one of the inventors of non-Euclidean hyperbolic geometry. Georg Wahl wrote to me that Lobachevsky became a dean of natural sciences and maths in Kazan University. In that position, he succeeded Johann Christian Martin Bartels, who was born in 1769 in Braunschweig. Bartels was the first teacher of the polymath Johann Carl Friedrich Gauss (1777 in Braunschweig as well) and helped him to get a first stipendium. At the age of 62, Gauss learned Russian in order to read the originals of Lobachevsky’s manuscripts. In many facets, the story was a good example for all of us to take personally

After a few temporary stays at IOPW in 1997-1999 and having finished my PhD in Moscow, I fully relocated to Germany in June 2000, where I would spend the next 5 years. As a result, I was working as a researcher under the direct supervision of Georg Wahl on three major topics: thermal barrier coatings, zirconia coatings on fibers, and high temperature superconducting tapes. After two or three weeks from my arrival, I came to him with some temperature dependences of the deposition rate of zirconia that I had experimentally measured. “Oh, these are the results!” he said, and, as usual, he was fully involved and very excited. Over the following days we discussed the results and their possible interpretation. While my thinking was rather empirical (finding the right deposition conditions for thermal barrier coatings was the main goal for me), he was keen to apply an existing theoretical background to my data points. He was one of the leading world experts in the field and I guess he liked that I had studied a large range of conditions, including those not necessarily interesting from a practical point view. This way

we could reliably observe three various CVD regimes – kinetic-controlled, diffusion-controlled, and homogeneous nucleation, and we found interesting pressure and concentration dependencies. All this provided the data for his analysis and conclusions. In 2001 we published the article “Thermal barrier coatings”, which in years to come became one of the most-often-cited publications of mine.

Even though he had an inclination to theoretical analysis, Professor Wahl was a committed industry-oriented researcher. IOPW was almost exclusively working on tasks which were practically important. Thermal barrier coatings and coatings on fibers for aerospace, silicon oxide coatings for plastic foils for the food industry, superconductor coatings for energy power, membrane coatings for gas separation – all were solidly business oriented with a great interest from industry. Large German companies and agencies financed most of those studies at IOPW. Being myself a CEO of a technology company today, I understand how hard it is to find fresh, viable and useful ideas and then to get practically oriented industrialists to put money into your efforts to elaborate these ideas. Professor Wahl was exceptionally successful in that: the majority of the institute’s people lived on projects paid by third parties and research directions were very diversified.

Just like many of the great scientists, Georg Wahl was an open-minded man. In 2014 he wrote to me that – at his Russian-speaking group meetings – they came to the conclusion that, after Shakespeare, “time went out of joint”. Beside many unexpected political developments then, Germany had an issue with refugees, and he mentioned that there were 800 refugees in Wolfenbüttel, but people helped each other and everything ran smoothly. I am sure Georg Wahl and his wife were doing everything they could to help. I think that this openness was an important part of Georg Wahl’s personality and that such people provided the necessary strength and forcefulness to society to help people through their troubles.

The last time I met Professor Georg Wahl was in the first week of January 2016. We spent a winter vacation with my family in Germany and Dr. Oliver Stadel, my former colleague from IOPW, arranged a visit to Wolfenbüttel. We had a nice evening, and talked a lot in a very lively manner about recent developments

in technology around superconductors, batteries, flat screens, electronics, etc. In particular, Georg Wahl was very excited by the idea of making airplanes electrical and he asked me many questions on this topic. I think that, having contributed to so many practical issues in his professional life, he had a feeling for developments with a potential to change the world to a much better place. I think for electrical flight there is a need for good engineers, new technologies, design, society, and economics – every aspect is huge. And it is where you need engineers with a broad style of thinking to make things happen. Georg Wahl was one of those unique characters.