

## Franz Hillenkamp (1936–2014)

Franz Hillenkamp, emeritus professor at the University of Münster passed away at the age of 78 on August 22, 2014. He was one of the pioneers in contemporary mass spectrometry, and in 1985, he discovered, together with his postdoc Michael Karas, the principle of matrix assisted laser desorption/ionization mass spectrometry (MALDI-MS). This, together with another ionization technique, electrospray ionization (ESI), allowed the analysis of large biomolecules such as proteins and nucleic acids with the result that MS is now an essential analytical technique in life science.

Franz Hillenkamp was born in Essen (Germany) on March 18, 1936. He completed his diploma at the Technische Universität München, and also received a masters degree from Purdue University in 1961. He obtained his PhD from the Technische Universität München in 1966. From 1963–1976, he had various positions at the Gesellschaft für Strahlen- und Umweltforschung in Munich, and was part-time lecturer in experimental physics at the University of Maryland, Munich Campus. Hillenkamp's main interest was lasers and their use in medicine and life science. In 1973, he built an instrument for tissue analysis based on laser desorption, the LAMMA 500. This instrument was one of the first attempts to carry out tissue imaging by mass spectrometry. It was later commercialized by Leybold Heraeus in form of the LAMMA 1000. From 1976–1986, he was Professor of Biophysics at the University of Frankfurt, and from 1986–2001, he was Professor of Biophysics and Medical Physics at the University of Münster, where he continued to be active after his retirement. From 1985, he was visiting professor at Harvard Medical School, and was still there as late as spring 2014. He was also visiting professor at the University of Napoli, Texas A&M University, and University of Innsbruck. Throughout his career, his focus was on understanding the mechanism behind MALDI and the use of MALDI-MS for analysis of nucleic acids.

Hillenkamp received numerous awards, including the American Society for Mass Spectrometry (ASMS) Award for a Distinguished Contribution in Mass Spectrometry, the Thompson Medal of the International Mass Spectrometry Foundation, and the Fresenius Award of the German Chemical Society. The Nobel Prize in 2002 was given to John Fenn and Koichi Tanaka for development of methods for MS analysis of large biomolecules. This raised a strong debate in the scientific community because I and many of my colleagues felt that it should have been given to Hillenkamp and Karas instead of Tanaka because they developed the now widely used MALDI technique before

Tanaka came up with his less-used alternative method.

I first met Hillenkamp in 1982 at The 2nd IFOS Conference in Münster. We met by coincidence at the stairs of the hotel and Hillenkamp asked me to join him for dinner. We discussed the prospects for analyzing large biomolecules and if laser desorption would be one possibility. Hillenkamp was skeptical based on his experience with the LAMMA instrument, but we agreed that it might be an option. At that meeting, Bo Sundqvist from Uppsala presented the use of plasma desorption MS to obtain the first mass spectra of a small protein, insulin. This result increased our optimism. Two years later, Hillenkamp and Karas discovered that upon laser desorption, much higher ionization yields were obtained for amino acids when mixed with tryptophan. They correctly interpreted this as a matrix effect and published this result as well as spectra of large polypeptides using a matrix in 1985. At the International Mass spectrometry Conference in Bordeaux in 1988, Hillenkamp presented MALDI mass spectra of a protein complex with a mass of 172500 Da. This presentation, together with a presentation of ESI spectra of intact proteins by John Fenn at the ASMS conference a few months previously, opened the eyes of the scientific community and paved the way for the rapid development of proteomics. However, Hillenkamp decided to pursue analysis of nucleic acids and contacted me to suggest that we should apply for EU funding for mass spectrometric analysis of nucleic acids. I was skeptical but Hillenkamp was insistent. We obtained the grant, which resulted in a very fruitful long-lasting collaboration with exchange of students and postdocs between our groups.

Hillenkamp inspired numerous students and colleagues by his enthusiastic engagement in science, his open mind, and fairness. He was very engaged with his students and was also demanding. He was extremely active, and took his students on long hikes every year. On the occasion of his 70th birthday in 2006, he did a parachute jump with a free fall of 3000 meters. For me, he was a highly appreciated colleague and friend. I was lucky to lecture back-to-back with him at the Pittcon in March 2014 in Chicago. We had dinner together and had what became our last discussion about science and the philosophy of life. I am grateful to have had the privilege of knowing him. He will be missed by his wife Annemarie, his family, and by colleagues and friends worldwide.

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