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LAUDATIO

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Steinkopff Prize 1996 awarded to Dieter Horn

Dieter Horn

On September 13, 1996, Dr. Dieter Horn will celebrate his 60th birthday. His friends, colleagues and coworkers congratulate him most cordially on this occasion. We wish him good health and plenty of energy so that we can enjoy his inspiring company and his unbounded enthusiasm for many more years. It is a great delight for us that on the occasion of his birthday the "Kolloidgesellschaft" should award Dieter Horn the Steinkopff Prize. With this award, his exceptional work in the field of polyelectrolytes, in the development of new analytical methods in polymer and colloid science, and in the development of precipitation processes for the generation of nanoparticles is acknowledged. Through his outstanding achievements and his exceptional commitment, colloid science and polymer science have achieved remarkable advances.

Dieter Horn was born in 1936 in Höchst/Odenwald, Germany. He studied chemistry at the Technische Hochschule Darmstadt and at the University of Heidelberg, where in 1963 he obtained his diploma in chemistry, having worked on the "Adsorption of Water on Montmorillonite at Elevated Temperatures" under the guidance of Professor Armin Weiß. He continued his studies at the Institute of Physical Chemistry of the University of Heidelberg where he worked with Professor Klaus Schäfer on Raman and IR spectroscopy. In 1967, he finished his dissertation on the "Infrared and Raman Spectroscopic Investigation of the H-bonding of 2,2,2,-Trifluoroethylamine". In 1968, Dieter Horn was appointed a Research Chemist by Professor George C. Pimentel and became a team member of the NASA Mariner Mars project at the Department of Chemistry and at the Space Sciences Laboratory of the University of California in Berkeley. In this position, Dieter Horn was notably involved in conducting the IR spectrometer experiments of the Mars probes Mariner VI and Mariner VII. Both fly-by missions were very successful and for the first time the Martian surface topography and the composition of the Martian atmosphere were revealed making use of a 2.5 km space simulation chamber he designed.

In 1970, Dieter Horn joined BASF AG in Ludwigshafen, Germany, and he is still with the company. He started his industrial career in the Main Laboratory of BASF, working on the physical and chemcial properties of dye pigments. In the following years, his work focused on the preparation of polymorphic forms and the determination of the coloristic properties of copper phthalocyanine pigments. At this stage, it became necessary to elucidate the nature of interaction mechanisms in highly concentrated pigment dispersions and in

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nonpolar solvents. He soon noticed that there was a lack of experimental methods and scientific instruments for characterizing particles in the colloidal domain in terms of size and electrophoretic mobility and for studying interactions in concentrated systems. Therefore, he developed an interference optical moving boundary method to measure the electrophoretic mobility of pigments dispersed in hydrocarbon media.

Apart from pigments and dispersions, Dieter Horn showed an increasing interest in the characterization of polyelectrolytes. He developed an optical two beam titration method to determine the charge density of polyelectrolytes. This method has proved to be so sensitive that traces of polyelectrolytes in the ppb range can be well detected. This titration method is now used in many laboratories for the quantitative determination of polyelectrolytes. Dieter Horn himself applied the polyelectrolyte titration method to a great variety of issues, especially to the behaviour of cationic polymers with respect to the adsorption on cellulose fibres. In this context, the electrostatic and steric effects as well as the influence of the molecular weight and charge density of the cationic polymers on their performance in the paper making process and in water treatment operations were determined.

With these accomplishments, Dieter Horn laid the foundations for a research group in colloid chemistry. Hence, in 1977, he was appointed head of the newly established group "Disperse Systems". In the following years, he focused on the vigorous extension of colloid science in this group with his interests extending into the fields of biophysics and molecular modeling. He strongly promoted the introduction and the exploration of new laser-optical methods to characterize colloidal systems. Thus, in the field of dynamic light scattering, a new procedure was developed to analyze polydisperse particle size distributions more accurately. Furthermore, the method of fiber-optic quasi-elastic light scattering (FOQELS) was developed, and subsequently FOQELS was utilized to study the long and short time dynamics of particles in highly concentrated dispersions, eventually leading to a technology for in-process monitoring of particle size in micronization processes. In the field of microelectrophoresis, several new experimental set-ups were explored, which were based on various homodyne or heterodyne laser Doppler techniques. In order to study flocculation processes on-line and under well-defined flow conditions, a fiber-optic floc sensor was developed. This floc sensor is not only applied for research purposes like the study of retention and drainage aids, but it is also used to automatically control the dose of polymeric flocculants in water treatment plants. The list of experimentally exploited techniques would not be complete without mentioning transient electro-birefringence, capillary wave spectroscopy, diffusing wave spectroscopy, and forced Rayleigh scattering. In review articles as well as in many talks and lectures, Dieter Horn presented his and his group's achievements to the international scientific community.

Dieter Horn's systematic and thorough acquistion of the basis of many colloidal phenomena led him to new scientific findings and also led to economical success. In the field of polyelectrolytes, from adsorption studies and from investigations of the flocculation mechanism of polyethylenimine, he concluded that the patch charge model accounts very well for the reversible flocculation behaviour of polyethylenimine and its unique performance in paper making. It is only recently that the postulation of the patch charge model has been directly verified by him by the newly developed technique of Chemical Force Microscopy (CFM) and by applying it to polyethylenimine adsorbed on latex particles. However, Dieter Horn's greatest scientific and economical success was the development of a continuous process for the formulation of carotenoids which is now known as the "mixing chamber micronizatoin" process. The micronization of synthetically produced carotenoids by this technology yields dry powders of submicron particles which are characterized by several advantageous properties. These carotenoid powders are very stable with respect to degradation, they are readily redispersable in water, and they have a high degree of bioavailability. The mixing chamber micronization process can even be controlled to produce a wide range of different carotenoid color appearances. Therefore, with this novel formulation process, the increasing need for carotenoids as a provitamin A source, as an antioxidant nutritional supplement, and as a nature-identical food colorant can be well met in the future.

In 1987, Dieter Horn was appointed head of the Department of Polymer Physics and Solid State Physics of BASF AG. In this new position he pursued his scientific work according to his principles on a much larger scale and with a much higher degree of responsibility. Thus he continued to work, and is still doing so, on the understanding of the basic structure-performance relationships in the fields of specialty polymers, the fields of the formulation of active substances like carotenoids, vitamins, pharmaceuticals, crop protection agents, and the wide field of polymer materials. He continues to promote the improvement of existing analytical methods in polymer and solid state physics, and furthermore he continues to explore and to introduce new physical methods like Fluorescence Correlation Spectroscopy (FCS), Chemical Force Microscopy (CFM), Field Flow

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Fractionation (FFF), and Matrix Assisted Laser Desorption Ionisation (MALDI), to name just a few. As a result, he further advances the reputation of the Polymer Physics and Solid State Physics Department of BASF, which manifests itself in participation in many projects. Scientists from all continents visit this department, give lectures or even stay as guest researchers, further proof of his cosmopolitan outlook.

Dieter Horn's successful life story is based on his strong commitment to excellency in scientific research and his dedication to colloid science. He has a very wide knowledge of the literature and he is well informed not only in the fields of chemistry and physics but also in engineering technologies and the life sciences. Therefore, he early realized that any major progress in colloid science can only be achieved by interdisciplinary approaches. From his sound knowledge he is able to deduce new ideas and visions which he pursues with continuity and determination.

Already today, the significance of Dieter Horn's work can be well appreciated. Above all, he recognized the importance of understanding colloid principles for economical success in many areas of the chemical industry. Thus, he initiated and directed the development of many new products and new processes. However, his commitment is not limited to his company, he is also a major driving force in the renaissance of colloid science in Germany.

Dieter Horn's publication list comprises more than 60 articles and about the same number of patents and patent applications. The number of his lively lectures is in the hundreds. He is a member of many scientific organisations. In the "Kolloidgesellschaft" he served as vice-chairman for many years. He is also a member of the board of the "GDCh Fachgruppe Makromolekulare Chemie". and served as a board member of the "Deutsche Bunsengesellschaft für Physikalische Chemie". He is further a founding member of the "International Association of Colloid and Interface Scientists (IACIS)" and the "European Colloid and Interface Society (ECIS)" and serves at present as a member of the board of trustees of the "Forschungsgesellchaft Kunststoffe e.V" Darmstadt, and as a member of the scientific council of the "Max-Planck-Institut für Kolloid- und Grenzflächenforschung", Berlin.

Dieter Horn's enthusiasm is not limited to his scientific and professional activities. He is happily married to Ulrike Horn and they have two charming children. He is a connoisseur of classical music and loves to play the piano. In the circle of his friends and coworkers he likes to play the guitar, and his ballads were the highlight of many a party. However, he not only enjoys human company, but he also greatly loves the outdoors. Thus he usually spends his holidays camping in the wilderness, investigating exotic birds and butterflies. His friends, colleagues and coworkers appreciate most his open-minded and natural character and his stimulating enthusiasm.

It is our wish that he should enjoy many more results of his work in good health.