Per Morgen was born on 6th of September 1944 in Aarhus, Denmark.
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Head of research, MION Technology ApS, Børkop, Denmark
Last university position held before retirement: Head of Research, Institute of Physics, Chemistry and Farmacy, University of Southern Denmark
Degrees (obtained in Denmark):
Cand. scient. (MSc) (1969), lic. scient. (PhD) (1978), dr. scient. (DSc) (1991), all in Physics.
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1969-1970 (Royal Veterinary and Agricultural University, Copenhagen)
Per Morgen graduated from Aarhus University in September of 1969 (Master of Science in Physics and Chemistry, with a project done at the Niels Bohr Institute, Risø, on Nuclear Reaction Spectroscopy of Os, Ir, and Pt nuclei). In 1970 employed as research assistant at the Royal Veterinary and Agricultural University, Institute of Physics, working with computer models of the Bohr-Mottelson Hamiltonian to describe the structures of the nuclei studied in his experimental thesis work, supported by a Carlsberg Foundation grant.
1970-1973 (Universidade de Brasilia, Brazil)
On November 1, 1970, he took up a position as professor and later UNESCO associate expert in the Physics Department at the University of Brasilia, Brazil, where he worked in and with Mössbauer Spectroscopy, Nuclear Magnetic Resonance- and Nuclear Quadrupolar Resonance studies of Fe- and other transition metal salts in solution.
1973-2021 (Odense University, later University of Southern Denmark)
In 1973 he returned to Denmark, and got employment at Odense University, where he concluded a PhD in Experimental Surface Science Studies and published several papers on the nuclear reaction studies initiated during his master's thesis work. The group in Odense was the first university group in Denmark to create facilities for surface studies with electron spectroscopies under ultrahigh vacuum conditions. At the conclusion of his PhD period, he was appointed as associate, tenured professor (lektor) at Odense University. There he has continued working with a wide range of surface problems, also in areas directly related to technical applications, such as semiconductor surface physics, tribology of lubrication and the running-in-problem of mechanical systems such as gears, and tribology of automotive brake systems. He has since 1991 led the efforts to build-up, through support from public and private funds, and from private instrument donations, a range of mostly ultrahigh vacuum-based surface analysis systems, filling four laboratories, for advanced basic studies and for technological investigations, comprising complementary microscopic-, spectroscopic-, and scanning probe tools, utilizing electrons, photons, and ions as probes, and scanning tunneling and atomic force microscope facilities. Most of these facilities are still operational under his guidance as emeritus.
1980-1986 (Stanford University and Technical University of Munich, Germany)
In 1980 he went on a one-year sabbatical to Stanford University, hosted by professors W. Spicer and I. Lindau in the Department of Electrical Engineering, to work with semiconductor surfaces and to learn about the applications of these in various devices. For three years, 1983-1986 he was a corresponding scientist at the Physik Department E20, TU München in Garching (The Technical University of Munich, Germany), working there with the interactions of oxygen on silicon surfaces, as a follow-up on work done at Stanford and personal connections established there with a German colleague, dr. habil. Eberhard Umbach.
1988-1991 (EuroPACE, Paris)
In 1988 he went on leave to act as Scientific Director of EuroPACE (European Association of Continuing Education) in Paris and stayed there for three years. He was responsible for the academic content of educational TV programs sent by satellite to companies and universities all over Europe, heading several program advisory boards within most of the different subject areas covered, and often acted as a host for live TV events staged to represent highlights within the subject areas.
After his return to Odense University in 1991, he continued his association with EuroPACE as a consultant for one year, and later took up the role as chairperson for the Scientific and Technology Network under the EADTU (European Association of Distance Teaching Universities), a related but purely academic network.
He has been on the board of the Danish Physical Society (as Vice President), and he is an emeritus member of the American Vacuum Society. He has been a member of the university's Study Board of Computer Science and Engineering, and the Study Board of Science, and a member of the educational board of the Physics and Technology School of Engineering. He is a member of the Danish Natural Sciences Academy (DNA).
Together with a colleague, Per Morgen founded the company NanoS ApS, in the Research Park Fyn, in 2001. This company obtained a patent related to a new method to control the thickness of oxides grown on silicon in a linearly controlled growth mode. The company ceased activities in 2003.
2003-2009 (Indian Institute of Science, Bangalore, India)
Since 2003 Per Morgen has been partner in bi-lateral projects with Professor Mohan G. Rao, Indian Institute of Science in Bangalore, about thin film growth with plasma deposition, surface treatments, and applications. He acted on a permanent base a visiting professor at IISc, Bangalore, with one-month visits to Bangalore in 2005 and 2008 and in 2009. He is still used as an external examiner for Indian PhD projects.
From 2002 to 2006 he was acting Head of the Physics Department at the University of Southern Denmark (formerly Odense University. In 2006 he became Head of Research in Materials-, Energy- and Environmental Studies in the newly established and merged Department of Physics and Chemistry as part of the direction of the department. In 2012 he retired from his positions and joined an institute under the Technical Faculty as emeritus, in the branch of chemical engineering. This institute is currently named Institute of Green Technology.

In 2016 he joined three persons from different areas of Danish Society to form an innovation company Mion-Technology to explore the possibilities of creating antimicrobial active surfaces on aluminum, based on copper, using the anodized porous alumina as a base for electrochemical copper deposition. The process developments are now covered by a European Patent. The company has changed status to a so-called ApS type company, with the name Mion Technology ApS in 2021.
His activities have during his career included basic research, technological developments, and the exposition of scientific and technological progress to the public, covering more than 180 refereed scientific papers and conference contributions. He has authored two instructional CD-ROMs published in the UK and translated a book about nanotechnology from German to Danish; has written papers and book chapters about open- and distance education and has been active as a presenter and facilitator of science to the public. He has been on the board of Folkeuniversitetet (The People's University, Denmark), and arranged and given several lectures in this activity. He has participated in an EU LEONARDO project to facilitate remote access to processes and analytical equipment via the Internet, called LASTED.net, from 2004 to 2007.
Per Morgen's research activities have included and currently include:
•Surface properties and reactions of silicon and silicon carbide surfaces
•Thin- and ultra-thin films grown with atomic control on silicon and silicon carbide surfaces (with Scandinavian partners)
•Nanostructured (porous) template materials (Al2O3) and their applications
•Instrumentation of new analytical methods for nano structural investigations (FINST innovation consortium, 2007-2009)
•Deployment of imbedded or surface attached nanoparticles for a wide range of new applications such as solar cells, fuel cells, hydrogen storage, surface antiseptics, and water cleaning purposes
•Polymer surfaces and plasma conditioning for their application in intra-ocular lenses (polymer research group, Risø, DTU, and IISc, Bangalore, and Madurai Eye Hospital, Madurai, India)
•Search for new materials for garbage incineration plants, Li-batteries, fuel cells and hydrogen storage, especially using plasma techniques or sputter depositions (IISc, Bangalore, India)
•The use of synchrotron radiation for surface studies (ASTRID, Aarhus University and in collaboration with Institute of Physics and Nanotechnology, Aalborg)
PM has been teaching courses in all basic disciplines of classical physics, about heterogeneous catalysis in chemistry, as well as advanced courses on materials and techniques for chemical and physical analysis of these.
PM has supervised 20 bachelor's and 26 master's projects in Denmark and in Brazil, 10 PhD projects in Denmark, and co-supervised one PhD project at Stanford. He has been an examiner of Doctoral Dissertations in Israel, Sweden and India and of several PhD theses in Denmark. He has been invited speaker at several international conferences. The last invited talk was held on-line in September 2021 for a meeting of the Aluminum Industry Association held in Nashville Tennessee. He is a regular referee for many influential journals of materials physics and chemistry, and has evaluated research proposals for French, Finnish and Dutch Foundations.
PM was invited by the Japanese Research Foundation to visit the Spring8 synchrotron radiation facility near Osaka in December of 2008, to participate in two experimental rounds with Japanese scientists, regarding how thermally excited nitrogen molecules interacted with Al surfaces with the purpose of forming AlN. He later continued this line of research in Denmark.
From his stays in different countries, he can communicate in English, French, German and (Brazilian-) Portuguese.
Scientific achievements (with different colleagues and students)
•Establishing the role of the nuclear dynamic Coriolis Coupling leading to mixing of rotational bands in deformed nuclei (Publications in Nuclear Physics (Journal) and included in the reference work: Table of Isotopes)
•Establishing the role of covalent bonding in the description of Electric Field Gradient Tensors (EFG) in Iron Group compounds
•Establishing methods to produce self-lubricating steel couples in sliding contacts using B and S additives in lubricants
•Establishing the mechanisms determining the conductivity in mixed ternary semiconductors containing Cd, Hg, and Te (Physical Review Letters, and other journals)
•Establishing all the steps of oxygen adsorption at room temperature on Si (111) surfaces including an intermediary state of oxygen molecular chemisorption as a peroxy-radical (Physical Review Letters and Physical Review)
•Establishing the steps in the mechanism of oxygen interaction with Si (111) and Si (100) surfaces with heating after saturation of oxygen coverage under room temperature adsorption, leading to a comprehensive understanding of how a self-limiting mechanism may be explored to form an ultrathin (around 8 Ångstrøm thick) oxide layer on Si surfaces
•Establishing a method based on microwave plasma assisted reaction of Si surfaces with nitrogen to form Si3N4 films on top of Si surfaces (Physical Review)
•Growth of epitaxial metal films (Cu, Al, Au and Ag) on top of Si (111) surfaces with quantum well behavior via an intermediate surface reaction with Cu
Technological Innovations and Developments in collaborations with technicians and students
•Development of self-lubricating mechanisms for sliding contacts of steel ele-
ments
•Construction of a 16-bit parallel interface system with existing analytical equipment in connection with microcomputers and PCs, and later development of software for this system based on LabviewTM
•Improving waste incineration systems inner wall linings with SiC composites
•A method to establish controlled linear growth of silicon oxide on top of silicon for MOS elements (with patent)
•A self-limiting growth method for ultrathin oxide layers on silicon surfaces
•Finding the optimal conditions for a mixed oxide/nitride phase for Si MOS systems
•Self-organizing gold, silver and copper nanostructures on porous alumina for powerful SERS (surface enhanced Raman spectroscopy) analyses

•Catalyst free deposition of carbon nanotubes in porous alumina templates
•Growth of high quality cubic SiC on Si by methane plasma deposition on silicon
•Growth of ultrathin alumina films for Si and SiC MOS systems with atomically sharp interfaces between oxide and substrate
•Development of a new catalyst for second generation bioethanol production without using enzymes, based on rice husks (with Al Muthanna University, Baghdad, Iraq)
•Development of new processing steps, including addition of Cu, to improve the crystalline ordering in SiC based diesel filters during high temperature sintering (with the DINEX company, Denmark)
•Electrochemical growth of copper in and out of the pores of anodized alumina films on aluminum to produce stable Al/Cu elements for antimicrobial and electrical applications (with the Mion Technology ApS company, Denmark). Patent granted in 2022.