apl. Prof. Dr. Friedrich Esch

Birthday, place	14.02.1967 in Göttingen (Germany)
Nationality	German
Work	Technical University of Munich, TUM School of Natural Sciences Department of Chemistry, Chair of Physical Chemistry Lichtenbergstr. 4, D-85748 Garching,
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CURRICULUM

2025 -	*Adjunct Professor for Physical Chemistry* at the chair of Physical Chemistry, TU Munich, Germany
2011 -	*Privatdozent* (Senior Lecturer)
2009 - 2011	Senior Researcher (*Akademischer Rat*) at the chair of Physical Chemistry, TU Munich, Germany (Chair holder: U. Heiz). Group leader of the STM activities. Focus on dynamics of catalytic atoms and size-selected clusters at solid-gas and solid-liquid interfaces
1998 - 2009	*Research Scientist* at the TASC-INFM National Laboratory, Trieste, Italy, Surface Physics Laboratory (with G. Comelli) 2004 - Group leader of the STM Laboratory. Focus on time-resolved scanning tunneling microscopy of catalytic surfaces in combination with synchrotron-based photoemission spectroscopy
1995 - 1998	*PostDoc* at ELETTRA Synchrotron Laboratory, Trieste, Italy, SUPERESCA-group (G. Comelli), applying fast high-resolution photoelectron spectroscopy (XPS) for the time-dependent characterization of catalytic model systems Collaboration with the ESCAMicroscopy group (M. Kiskinova) and R. Imbihl (University of Hannover) in projects on XPS microscopy of chemical waves and adsorbate-induced segregation
1991 - 1995	*PhD student* at the Fritz Haber-Institute of the Max Planck Society, Berlin, Germany, Department of Physical Chemistry (Supervisor: R. Imbihl; Director: G. Ertl). Thesis on the adsorption and catalytic reduction of NO on platinum and ruthenium single crystal surfaces
1985 - 1990	*Diploma studies* in Chemistry at the Swiss Federal Institute of Technology Zürich (ETH Zürich), Switzerland. Thesis in Macromolecular Chemistry on the spinning of poly-(p-phenylen)-terephthalamide and its molecular and supramolecular structure investigated by x-ray diffraction (Supervisor: U. Suter)

AWARDS AND FELLOWSHIPS

2025	Award for Excellence in Teaching 2024 from the Bavarian State Ministry of Science and the Arts
2016	TUM Teaching Endowment Fund Prize (with A. Bauer and C. Scheurer) for the project "Marketplace of opportunities" – modularization of Chemistry laboratory courses into interdisciplinary task sets

2015	Ernst Otto Fischer Award for Excellence in Teaching, TU Munich, Germany
2014	TUM Teaching Endowment Fund Prize (together with Dr. Christoph Scheurer) for the project "Laboratory course on data acquisition, evaluation and simulation"
2009	CNR prize for excellent or strategically relevant results
1992 - 1994	Kekulé-Stipendium, PhD stipend granted by the *Verband der Chemischen Industrie* (German Chemical Industry Association)
1990	Prize of the *Stiftung Kunststoff-Technik* (Swiss Foundation for Plastics Technology) for an exceptional Diploma Thesis
1987 - 1990	Stipend of the *Studienstiftung des Deutschen Volkes* (German National Academic Foundation)

RESEARCH

Research interests	Characterization and manipulation of single clusters; properties of size-selected supported clusters in the non-scalable size regime: morphology, fluxionality, diffusion, reactivity, heat transfer and solvation; cluster catalysis of energy-relevant processes Structure and reactivity of catalytic metal and oxide surfaces: Reaction dynamics, influence of strain and redox chemistry of reducible oxides Development of Fast Scanning Probe Techniques for the study of surface dynamics with ms time resolution; Scanning Probe Techniques in reactive gas environments (STM and AFM) and in liquids (electrochemical STM) Growth and manipulation of crystalline films and hybrid structures on surfaces as new supports for truly monodisperse cluster-assembled materials: From oxide films and coordination assemblies to graphene and BN nanomeshs and carbonitride networks
Equipment	Variable temperature STM/AFM, combined with XPS and highly sensitive pulsed reactivity measurements (Sniffer), coupled to a size-selected cluster source Liquid/electrochemical STM under controlled gas atmospheres Custom Fast STM control systems for the acquisition of (i) images at frame rates ≥1 Hz, (ii) particle tracking with time resolution down to 50 µs and lateral precision of 0.1 Å under full feedback, (iii) drift-corrected, position-precise tunneling current tracking down to 1 MHz
Expertise	Scanning Tunneling Microscopy and Spectroscopy (STM, STS) at variable and low temperature in vacuum, air and liquid environment Atomic and Kelvin Probe Force Microscopy (contact and non-contact AFM and KPFM) Electron spectroscopies (AES, UPS, MIES) and electron diffraction (LEED) Synchrotron-based spectroscopy and microscopy (XPS, NEXAFS, PEEM, XPEEM, LEEM) Mass spectroscopy (QMS) and Thermal Desorption Spectroscopy (TDS) UHV and low temperature techniques; thin film growth Instrumentation development: Implementation of temperature control in STMs for the study of reaction dynamics with low thermal drift, Fast STM, Cantilever-based Microcalorimetry, Data analysis for XPS and STM data