

Eric Bakker, November 2023

Professor, Department of Inorganic and Analytical Chemistry, University of Geneva, Geneva, Switzerland

<https://www.ericbakker.ch>

Academic Degrees and Schooling

1989 Dipl. Chem. ETH, ETH Zurich
1993 Ph.D. natural sciences, ETH Zurich. Thesis Supervisor: Wilhelm Simon

Training and Education

1985-89 University studies of Chemistry, ETH Zurich
1989-90 Industry practice, Mettler-Toledo, Urdorf, Switzerland
1990-93 Doctoral studies, ETH Zurich, Switzerland
1993-95 Postdoctoral studies, University of Michigan, Ann Arbor, Michigan

Professional Activities (post-graduate):

1990–93 Project Manager, Mettler-Toledo, Urdorf, Switzerland.
1993–95 Postdoctoral studies, University of Michigan, Ann Arbor, Michigan
1995–98 Assistant Professor, Auburn University, U.S.A.
1998–03 Associate Professor, Auburn University, U.S.A.
2000 Visiting Professor, Swiss Federal Institute of Technology, Zurich, Switzerland
2001 Visiting Professor, Ecole Normale Supérieure, Paris, France
2003–05 Professor, Auburn University, U.S.A.
2005–08 Professor, Purdue University, West Lafayette, U.S.A.
2007–10 Professor and Director, Curtin University of Technology, Perth, Australia
2007–10 Director, Western Australian Nanochemistry Research Institute, Perth
2010– Professor, University of Geneva, Switzerland
2012–16 Director, Department of Inorganic and Analytical Chemistry, University of Geneva

2015 Visiting Professor, Keio University, Yokohama, Japan
2016 Visiting Professor, University of New South Wales, Sydney, Australia
2022– Vice President, Section of Chemistry and Biochemistry, University of Geneva
2023– Director, Department of Inorganic and Analytical Chemistry, University of Geneva

Society Memberships

Royal Society of Chemistry (Fellow FRSC), American Chemical Society, Swiss Chemical Society, International Society of Electrochemistry, Society for Electroanalytical Chemistry, Matrafüred Society for Electrochemical Sensors

Honours and Awards

2024 Charles N. Reilley Award, Society for Electroanalytical Chemistry (Pittcon)
2019 Simon-Widmer Award, Swiss Chemical Society
2014 Robert Boyle Prize, Royal Society of Chemistry
2014- Fellow of the Royal Society of Chemistry
2009 Australian Professorial Fellowship, Australian Research Council
2004 Roche Prize for Sensor Technology
2003-05 Alumni Professorship, Auburn University, USA
2001 Young Investigator Award, Society for Electroanalytical Chemistry (U.S.A.)
2000 Sigma Xi outstanding researcher award (U.S.A.)

Technical and Scientific Roles and Service

2020– Executive Editor, ACS Sensors
2015–20 Associate Editor, ACS Sensors
2006–11 Subject Editor, Sensors and Actuators, B
Co-organizer, Matrafüred Conference Series and Pittcon Organized Contributed Sessions in the field (many years), Euroanalysis 2023.
2014–15 Regional Representative of Switzerland, International Society of Electrochemistry

Research Topics

Electrochemical Sensors, Membrane Electrodes, Potentiometric Sensors, Optical Sensors, Emulsified Sensing and Titration Reagents, Paper-Based Analytical Devices, Environmental Aquatic Sensing, Membrane Transport and Separation, Dynamic Electrochemistry and Ion Transfer Voltammetry, Chemical Imaging, Colorimetric Imaging and Sensing, Polymer and Ionophore Design.

Publications and Metrics

>410 Publications

23'400 global citations and H-index of 82 (Google Scholar)

Research Accomplishments of Eric Bakker

Fundamental Electrochemistry

Describing ion-selective electrode selectivity based on equilibrium theory and ion-exchange processes. Understanding transmembrane ion fluxes at zero current to explain the detection limit of membrane electrodes. Unraveling the response mechanism of potentiometry polyion sensors. Development of various methods to quantify ion-ionophore interactions in the membrane. Understanding the mechanism of solid state ion-to-electron transducing materials used in ion-selective electrodes. Use of light induced proton gradients across liquid membranes to generate electricity. Understanding the function of voltage sensitive dyes for the optical readout of interfacial potential. Optical sensors based on lipophilic solvatochromic dye transducers and emulsion-based titration reagents. Thin membrane ion-selective electrodes interrogated by cyclic voltammetry to quantify molecular interactions.

Electrochemical Methodology

Development of dynamic electrochemistry methods for the readout of ion-selective membranes. Chronopotentiometry with ion-selective electrodes for speciation analysis. Exhaustive thin layer coulometry at ion-selective membranes for absolute, calibration-free measurements. Using applied current for local sample perturbation followed by potentiometric detection. Thin membrane ion-selective electrodes for potentiometric multianalyte detection. Local acidification at sensing surfaces by transport across the membrane. Development of potentiometric affinity-based biosensors by modulating transmembrane fluxes. Solid-state reference electrode by localized electrochemical release of the potential determining ion. Development of optical readout methodologies coupled to ion-selective electrodes, including self-powered colorimetric detection. Direct energy transfer from potentiometric measurement cell to electronic capacitor. Use of symmetry to improve potentiometric solid state sensor stability.

Electrochemical Materials

Development of recognition elements covalently attached to the polymeric membrane material. Surface modification of sensing membranes by Click chemistry. Development of plasticizer-free membrane materials. Lipophilic cation-exchangers with improved properties relative to tetraphenylborate derivatives. Development and characterization of lipophilic chromogenic indicators and lipophilic solvatochromic dye transducers. Development of all-solid-state membrane electrodes based on conducting polymer and nanoscale materials.

Environmental Electrochemistry

Novel, fast responding carbon dioxide probe based on the measurement of a pH electrode against a carbonate-selective electrode. Development of a selective desalination principle (and coulometric chloride sensor) based on a permselective membrane and electrochemical halide plating on a silver electrode. Development of membrane-based thin layer sample acidification cells. Development and deployment of submersible sensing systems for the *in situ* detection of pH, halides, nitrate, nitrite, carbonate and calcium ions in seawater samples. Development of deployment of a self-contained low-power nutrient sensor for freshwater systems using intermittent calibration. Development of membrane-based reagent delivery for phosphate detection in seawater samples at environmentally relevant concentrations. Conception of an ultrasensitive readout of potentiometric sensors on the basis of constant potential coulometry by using an electronic capacitor and demonstrating of the measurement of ultra-small seawater pH changes. With Tercier-Waeber: development and field deployment of gel integrated stripping voltammetric sensing probes for the detection of arsenate and arsenite and mercury ions.