

Dr. Artur Braun, Marie Curie Fellow	
CURRICULUM VITAE	April 2014

Office address

Laboratory for High Performance Ceramics
 Empa - Swiss Federal Laboratories for
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 Switzerland

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EDUCATION

Lawrence Berkeley National Laboratory, California, USA

Postdoctoral Fellow "Lithium Battery Degradation" (Prof. Elton J. Cairns) and "Protein Spectroscopy" (Prof. Stephen P. Cramer), 1999 –2001.

ETH Zürich, Switzerland

Doctorate in Electrochemistry "Supercapacitors" (Prof. A. Wokaun), 1996 – 1999.
 Thesis: *Development and Characterization of Glassy Carbon Electrodes for a Bipolar Electrochemical Double Layer Capacitor* (22 Dec. 1999).

RWTH Aachen University of Technology, Germany

Diploma in Physics, 1989 – 1996 (Prof. H. Ibach); Prädikat "gut".
 Thesis: *Korrelation von Struktur, Magnetismus und Morphologie ultradünner Ni-Filme auf Cu₃Au(100)*.
 Medical School: 1992-1994; Studies in "Mineralogy & Mining": 1990-1992.

Abendgymnasium Aachen, Germany

1985 – 1988; Abitur "sehr gut".

Federal Department of Treasury, Germany

Trainee, 1982 – 1984; Prädikat "gut" (best in class).

CURRENT POSITION

At Empa since 2005, Marie Curie Fellow since 2006, with indefinite career position since 2008, and Group Leader since 2010. In this capacity, I guide and conduct fundamental and applied research on energy materials, particularly on surfaces and porous films for fuel cells, photo-electrochemical cells and batteries, including the method development.

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I am Facility Manager of our High Temperature Electrochemistry Laboratory, and I have built up our Photoelectrochemistry Laboratory. My *Principles & Fundamentals Group of Materials for Ceramic Energy Technologies* is balanced in terms of gender and cultural background and counts at present 2 PhD students, 4 postdoc scientists, all of which are supported by extramural competitive funds. On average I have 2 MSc/BSc students.

CURRENT RESEARCH ACTIVITIES

My current activities center on the physical chemistry of energy materials, their structural and functional assessment, and their deployment in energy storage and conversion devices. This includes chemical kinetics and intra-molecular dynamics of charge carriers, including also the method development. In particular, I work on nanoparticle based semiconductor metal oxide photocatalyst nanoparticles and photo-electrode assemblies for solar water splitting and hydrogen generation, and the functionalization of metal oxide surfaces with proteins from photosynthesis. With similar materials we develop also gas sensors. And we are developing strategies for micro-structuring and nano-structuring of materials based on self-assembly and pattern formation using polymer host matrices. My new research interest is the functionalization of surfaces with genetically engineered proteins from photosynthesis and their deployment in solar hydrogen production reactors for artificial photosynthesis.

TEACHING ACTIVITIES

Since 1998 I have been mentoring students at ETHZ, UC Berkeley, Univ. of Kentucky.

Public tour guide at Berkeley National Laboratory 2000-2001.

Since 2007 advisor of PhD students.

MSc thesis examiner at EPFL Lausanne since 2009.

Tartu University Doctoral School, 20-21 June 2011, Tartu, Estonia

Conference-School August, 2010, Palanga, Lithuania

Conference-School August, 2011, Palanga, Lithuania

Tartu University Doctoral School, 26-28 June 2013, Tartu, Estonia

International conference "Recent research and teaching trends in Physics", St. Teresa College, Cochin, India, December 2014.

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PREVIOUS RESEARCH/PROFESSIONAL APPOINTMENTS

- **2013 Sept; GIST, Gwangju, Republic of Korea**
Visiting Scientist; Dept. of Physics & Photonics, AP-XPS on photo-electrodes
- **2011 Oct; Hanyang University, Republic of Korea**
Visiting Scientist; Physics Department, AP-XPS on metal oxide electrodes
- **2010 Nov - 2011 Jan; University of Hawaii at Manoa, Honolulu, USA**
Visiting Scientist; School of Ocean and Earth Sciences and Technology, Hawaii
Natural Energy Institute, Photo-electrochemical cells for solar H₂ production
- **2005 – present Empa, Switzerland** (Department Modern Materials and Surfaces;
Laboratory for High Performance Ceramics)
- **2001 – 2005 University of Kentucky, Lexington KY, USA**
Staff Physicist, Consortium for Fossil Fuel Sciences, Dept. Materials & Chemical
Engineering; speciation of air pollutants and fossil fuel reaction products
- **1999 – 2001 Lawrence Berkeley National Laboratory, Berkeley CA, USA**
Staff Chemist, X-ray spectroscopy on Li-batteries and proteins (with E.J. Cairns at
Env. Ener. Technol. Div., and S.P. Cramer in Phys. Biosciences Div. and UC Davis)
- **1999 Laboratory for Neutron Scattering, Villigen and ETH Zürich**
Neutron reflectometry on Ni/Ti multilayers for neutron mirror applications (with
Dr. Peter Böni, Laboratory for Neutron Scattering)
- **1996 – 1999 PSI Villigen, Switzerland**
Doctorate thesis on electrochemical supercapacitors (with Prof. Alexander
Wokaun, Dr. Rüdiger Kötz and Dr. Otto Haas in the Electrochemistry Laboratory)
- **1996 Mitsubishi Semiconductors Europe GmbH, Alsdorf, Germany**
- **1994 – 1996 Forschungszentrum Jülich (Institut für Grenzflächenforschung
und Vakuumphysik IGV), Germany**
Diploma thesis on ultrathin films; salaried position (Profs. H. Ibach, M. Wuttig).
- **1994 Philips Research Laboratories, Aachen, Germany**
Salaried summer intern, electro ceramics for DRAM and inkjets (with Dr. Joseph
Pankert and Dr. Mareike Klee).
- **1982 – 1996 Department of Treasury, Germany**
Customs official in Aachen and in Cologne

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SUPERVISION OF PHD THESES

1. **Co-Advisor** for *Investigation of the driving forces of metal-insulator transitions in LaSrFeNi-oxides: Correlation of crystallographic structure, electronic structure and transport*; Swiss National Science Foundation <http://p3.snf.ch/project-116688> ; 01.08.2007 – 31.07.2010; Candidate Ms. Selma ERAT, Defense 24 June 2010, **ETH Zürich**, Materials Science Department Prof. L.J. Gauckler, Diss ETHZ # 19155 <http://e-collection.library.ethz.ch/eserv/eth:2123/eth-2123-01.pdf>
Now Associate Professor at Toros University, Mersin, Turkey
2. **Co-Advisor** for *Synthesis and assessment of mixed metal-oxide nanoparticles films and heterojunctions for solar photoelectrochemical hydrogen fuel production*; Swiss Federal Office of Energy # 153476; 01.02.2009 – 31.01.2012; Candidate Mr. Debajeet K. BORA; **University of Basel**, Dept. of Chemistry, Prof. E.C. Constable. <http://edoc.unibas.ch/1451/>
Congratulations for winning the Empa 2013 Research Award (5,000 CHF)
3. **Co-Advisor** for *Effect of lattice volume and imperfections on the proton-phonon coupling in proton conducting lanthanide transition metal oxides: High pressure and high temperature neutron and impedance studies*; Swiss National Science Foundation <http://p3.snf.ch/project-124812> ; 01.09.2009 – 31.08.2012; Candidate Ms. Qianli CHEN, **ETH Zürich**, Physics Department; Prof. Joel Mesot <http://e-collection.library.ethz.ch/eserv/eth:6035/eth-6035-01.pdf>
Now A. v. Humboldt postdoc researcher at Max Planck Institute für Polymerforschung, Mainz, Germany
4. **Co-Advisor** for *Oxide nanoparticle based gas sensors*; Swiss-Polish PhD School; 01.02.2010 – 31.01.2013; Candidate Ms. Dorota FLAK (passed thesis defense with award on 20 May 2013); **AGH Krakow**, Materials Science & Ceramics Department; Prof. Mieczyslaw Rekas
5. **Co-Advisor** for *Ion conducting thin films*; Sciex project with **Kaunas University of Technology**, Lithuania, 01.03.2011 – 28.02.2012; Candidate Mr. Edvinas NAVICKAS (wins E-MRS-Award 2012); Physics Department; Prof. S. Tamulevicius
6. **Co-Advisor** for *Defects in the bulk and on surfaces and interfaces of metal oxides with photo-electrochemical properties: In-situ photo-electrochemical and resonant x-ray and electron spectroscopy studies*, Swiss National Science Foundation <http://p3.snf.ch/project-132126> ; 01.06.2011-31.05.2014; Candidate Mr. Yelin HU, **EPFL Lausanne**, Prof. Michael Grätzel

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7. **Co-Advisor** for *Reaction-diffusion processes for the growth of patterned structures and architectures: Bottom-up approach for photoelectrochemical electrodes*, Swiss National Science Foundation <http://p3.snf.ch/project-137868> ; 01.11.2011-31.10.2014; with **Univ. of Basel**, Prof. E.C. Constable

I AM *ORGANIZER/CO-ORGANIZER OF FOLLOWING CONFERENCES & WORKSHOPS

1. *MRS Spring Meeting 2015 in San Francisco: Meeting Chair
2. *International Exploratory Workshop on Soft X-rays, Electrochemistry, and Energy Materials (SNF # IZ32Z0_147413), June **2013**, Empa Dübendorf, Switzerland (with J. van Bokhoven and T. Huthwelker).
3. *European Spallation Source (ESS) Science Symposium "*Neutrons for Future Energy Strategies*", 27-29 May **2013** at PSI Villigen, Switzerland (with J. Embs and A. Remhof)
4. *MRS Spring **2013**; Symposium D: *From Molecules to Materials–Pathways to Artificial Photosynthesis* (with Elena Rozhkova, Ana Moore), San Francisco.
5. MRS Fall **2012** Symposium Boston: *Frontier of Chemical Imaging: Integration across Platforms of Electrons, Photons, and Ions*, with ORNL, PNNL, CLS
6. *MSE **2012** Darmstadt, Symposium D4 "*Thin Films*", with E. Zschech.
7. Co-Organizer E-MRS Spring Meeting in Nizza/France, May **2011**, *Materials for solar hydrogen via photoelectrochemical production* (with M. Grätzel, L. Meda)
8. *MRS Spring **2011** Symposium J: *Protons in Solids* (with Sossina Haile, Rob Robinson, Paul Gannon), San Francisco
9. ***2010**, ALS User Meeting Workshop, Berkeley/USA, *Defects in Inorganic Solids and their Relation to Electronic Properties* (with C. Heske, M. Marcus, J. Guo)
10. *MRS Spring **2010** Symposium W: *Diagnostics and Characterization of Energy Materials with Synchrotron/Neutron Radiation* (with H. Schober), San Francisco
11. ***2009**, ALS User Meeting Workshop, Berkeley/USA, *Soft X-Ray Spectroscopy in Renewable Energy Generation and Storage Materials* (with C. Heske, J. Guo, H. Bluhm)
12. *MRS Spring **2009**; Symposium S: *Materials in Photocatalysis /Photoelectrochemistry for Environmental Applications and H₂ Generation* (with P. Alivisatos), San Francisco
13. Co-Organizer **2006**, MODVAL3 "*Modeling and experimental validation in fuel cells*", Empa (with Peter Holtappels)

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EDITORIAL OFFICE

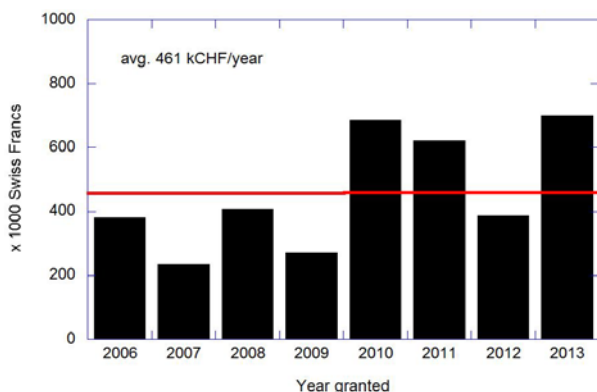
- Since **2011** Editor "Energy Materials" for Current Applied Physics (Elsevier, ISSN: 1567-1739)
- Lead Guest Editor **2010** Journal of Materials Research Vol. 25, No. 1, *Photocatalysis for Energy and Environmental Sustainability*
- Lead Editor MRS Proceedings Volume 1171E, **2009** *Materials in Photocatalysis and Photoelectrochemistry for Environmental Applications and H₂ Generation*
- Co-Editor MRS Proceedings Volume 1262, **2010** *In-Situ and Operando Probing of Energy Materials at Multiscale Down to Single Atomic Column—The Power of X-Rays, Neutrons and Electron Microscopy*

COMMUNITY SERVICE

Expert for Intergovernmental Panel on Climate Change "renewable energy" 2008 Lübeck
 I review on average 5-10 manuscripts per year for numerous (~40) international journals
 Proposal Reviewer for U.S. Department of Energy
 Proposal Reviewer for Canadian Light Source
 Proposal Reviewer for Staatssekretariat für Wirtschaft SECO Switzerland
 Proposal Reviewer for ACS Petroleum Fund
 Proposal Reviewer for Israeli Ministry of Science and Technology
 Proposal Reviewer for Swiss-Hungarian Contribution for Joint Research Projects
 Proposal Reviewer for Romanian Government National Research Council
 Proposal Reviewer for Chile ECOS-CONICYT
 Board Member of the Swiss Synchrotron/Neutron User Association JUSAP
 Advanced Light Source User Executive Committee Member 2013-2015
 Swiss Deputy Representative of the European Synchrotron User Organization
 Swiss Coordinator for COST TD1102 "PHOTOTECH" (with E.C. Constable)
 Swiss Coordinator for COST CM1104 "red ox" (with U. Vogt)
 Expert on PEC Water Splitting for IEA-HIA Annex 26 PEC Working Group

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COMPETITIVE FUNDING: ~ 3.9 Mio SWISS FRANCS (~2.8 Mio EUR) SINCE 2006



<i>Title/Akronym/Program</i>	<i>Year</i>	<i>Granted</i>
INTEGRATION OF GENETICALLY ENGINEERED ALGAL LIGHT ANTENNA PROTEINS ON SEMICONDUCTING METAL OXIDE SUBSTRATES FOR ENHANCED SIGNAL PROCESSING AND LIGHT HARVESTING APPLICATIONS (COST ACTION TD1102; WITH L. THÖNY-MEYER)	2013	CHF 120,000
SOUTH-AFRICAN SWISS JOINT RESEARCH PROJECT "PRODUCTION OF LIQUID SOLAR FUELS FROM CO2 AND WATER: USING RENEWABLE ENERGY SOURCES"	2013	CHF 224,358
INTERNATIONAL EXPLORATORY WORKSHOP ON SOFT X-RAYS, ELECTROCHEMISTRY, AND ENERGY MATERIALS, IZ32Z0_147413+BfE+SPECS	2013	CHF 25,800
STRATEGIC KOREAN-SWISS COOPERATIVE PROGRAM IN SCIENCE AND TECHNOLOGY (WITH PROF. B.S. MUN, ERTL-CENTER, GIST, KOREA)	2013 (PI)	CHF 40,000
NANO TERA 20NA21-145936; SHINE: "SOLAR HYDROGEN INTEGRATED NANO ELECTROLYZER" (WITH PROF. MOSER, EPFL)	2013	CHF 435,000
2013 ESS SCIENCE SYMPOSIUM: NEUTRONS FOR FUTURE ENERGY STRATEGY (WITH J.P. EMBS/PSI AND ARNDT REMHOF/EMPA)	2013	CHF 15,500
BIOMIMETIC PHOTOELECTROCHEMICAL CELLS FOR SOLAR HYDROGEN GENERATION; THE VELUX FOUNDATION	2012 (PI)	CHF 230,000
POSITIVE ELECTRODE MATERIALS FOR LI-ION BATTERIES FOR ELECTRIC VEHICLES APPLICATION –LIBEV, WITH AGH KRAKOW PROF. MOLEND	2012 (PI)	CHF 157,000
ELECTRONIC ORIGIN OF CR POISONING IN CERAMIC FUEL CELL CATHODES ISJRP INDO-SWISS GRANT NO.: 138864, WITH PROF. D.D. SARMA, INDIA INSTITUTE OF SCIENCE	2011 (PI)	CHF 228,213

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CO-FUND FOR DR. TZU-WEN HUANG ON SOFC CATHODES (I AM MARIE CURIE MENTOR)	2011	CHF 80,000
REACTION-DIFFUSION PROCESSES FOR THE GROWTH OF PATTERNED STRUCTURES AND ARCHITECTURES: BOTTOM-UP APPROACH FOR PHOTOELECTROCHEMICAL ELECTRODES, SWISS NATIONAL SCIENCE FOUNDATION # 200021-137868; WITH BASEL, PROF. CONSTABLE	2011 (PI)	CHF 313,000
SPECTROSCOPY ON PHOTO-ELECTROCHEMICAL ELECTRODE MATERIALS, WITH HANYANG UNIVERSITY, REP. OF KOREA; KOREAN-SWISS PROGRAM SNF # IKZ	2010 (PI)	CHF 15,000
OXIDE HETEROINTERFACES IN ASSEMBLIES FOR PHOTO-ELECTROCHEMICAL APPLICATIONS ", UNIV. OF HAWAII, USA; PERSONAL GRANT FROM SNF # IZK0Z2-133944	2010 (PI)	CHF 12,500
SOFC-LIFE - SOLID OXIDE FUEL CELLS - INTEGRATING, DEGRADATION EFFECTS INTO LIFETIME PREDICTION MODELS; EU FP7 PROJECT°256885	2010	EUR 225,000 (290,000 CHF)
PROTON CONDUCTIVITY IN THIN CERAMIC FILMS SCIEX # - 10.010, WITH KAUNAS UNIVERSITY, LITHUANIA	2010 (PI)	CHF 50,000
DEFECTS ON METAL OXIDE SURFACES AND SUPERLATTICES WITH PHOTO-ELECTROCHEMICAL PROPERTIES; IN-SITU PHOTO-ELECTROCHEMICAL AND RESONANT X-RAY AND ELECTRON SPECTROSCOPY STUDIES, SNF# 200021-132126	2010 (PI)	CHF 160,000
NANOBIO-INTERFACES FOR PHOTOCATALYTIC SOLAR HYDROGEN", WITH UNIVERSITY OF SZEGED, HUNGARY, SCIEX # - 10.013	2010 (PI)	CHF 150,000
SEMICONDUCTOR NANOWIRES AND NANOCOMPOSITES FOR SOLAR CELL APPLICATIONS AND THEIR PHOTONIC CHARACTERIZATION, INDO SWISS JOINT RESEARCH PROGRAM (ISJRP)	2010 (PI)	CHF 8,400
NEUTRON SCATT. ON PROTON CONDUCTORS SNF #124812 (PI)	2009	CHF 196,000
NANOSTRUCTURED PEC EU FP7#227179	2009	CHF 75,000
IP03-092008, CO-PI: THE MECHANISMS OF METALINSULATOR TRANSITIONS UPON CATION DOPING IN LANTHANUM STRONTIUM FERROUS OXIDE –EXPERIMENTAL AND COMPUTATIONAL STUDY	2008	CHF 38,800
NANOPARTICLE SOLAR H2 GENERATION BfE #152316-101883; #153613-102809 (PI)	2008	CHF 160,000
BASIC RESEARCH EQUIPMENT FOR PHOTOELECTROCATALYSIS R'EQUIP SNF # 206021-121306	2008 (PI)	CHF 210,000
MOLECULAR LEVEL ASSESSMENT OF THE SOLID-LIQUID INTERFACE IN PHOTOCATALYTIC SYSTEMS WITH SUM FREQUENCY GENERATION SPECTROSCOPY AND ITS RELEVANCE TO SUPERHYDROPHILICITY (EMPA BOARD OF DIRECTORS 7. F&E)	2007 (PI)	CHF 100,000
INVESTIGATION OF THE DRIVING FORCES OF METAL-INSULATOR	2007	CHF 135,000

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TRANSITIONS IN LASrFeNi-OXIDES: CORRELATION CRYSTALLOGRAPHIC STRUCTURE, ELECTRONIC STRUCTURE AND TRANSPORT, SNF # 200021-116688, SNF # 200021-116688/1 (PI)	(PI)	
TAILORING PROTON TRANSPORT IN OXIDE CERAMICS (AKRONYM: PROTONICS; EMPA BOARD OF DIRECTORS 6. F&E)	2006 (PI)	CHF 200,000
CEMTEC, Swiss CCEM # 705 (co-PI)	2006	CHF 60,000
HiTEMPECHEM, EU FP6 MARIE CURIE MIRG #042095 (AWARDEE)	2006	EUR 80,000 (120,000 CHF)