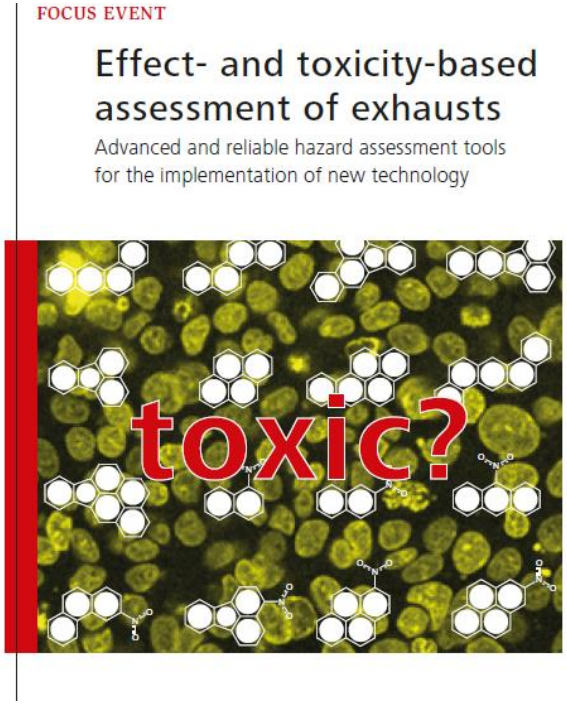
Willkommen
Welcome
Bienvenue

Empa
Materials Science and Technology

# Empa: the Place where Innovation Starts

Focus Event 16 March 2018

**PD Davide Bleiner**
Head of Division Advanced Analytical Technologies



# Empa within the ETH Domain

Empa
Materials Science and Technology

**Federal Department of Economic Affairs, Education and Research**

**Board of the ETH Domain**

**Institutes of Technology**

- **Empa Dü**
- **Empa SG**
- **Empa Th**

PAUL SCHERRER INSTITUT PSI

eawag aquatic research

WSL

ETH zürich

EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Empa
Materials Science and Technology

~~EMPA~~

**Prof. G.L. Bona, CEO**

# Facts and Figures (2017)

Empa
Materials Science and Technology

| | | |
|---|---|---|
| 3 Sites | | Dübendorf, St. Gallen, Thun |
| 6 Departments | 30 | Laboratories |
| | 960 | Employees (890 FTE; about 28% Women) |
| | 32 | Professors |
| | 210 | PhD Students |
| | 44 | Apprentices |
| | > 190 | Bachelor / Master Students & Interns |
| Budget | 114 | Mio. CHF Public Funding |
| | 64 | Mio. CHF Third Party Means |
| Scientific Output | > 690 | Peer-reviewed ISI-Publications |
| | 60 | Seminars & Conferences at Empa-Academy |
| Third Party Projects | around 70 | running EU-funded Projects |
| | around 120 | running SNSF Projects |
| | around 100 | running CTI Projects |

# Empa's Research Focus Areas

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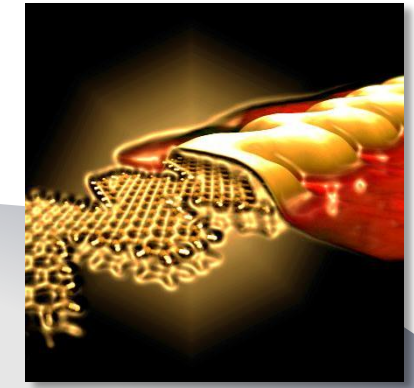
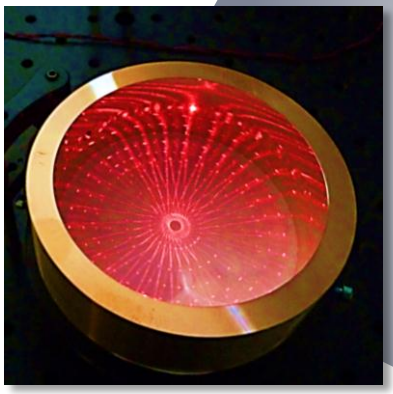
Health &
Performance



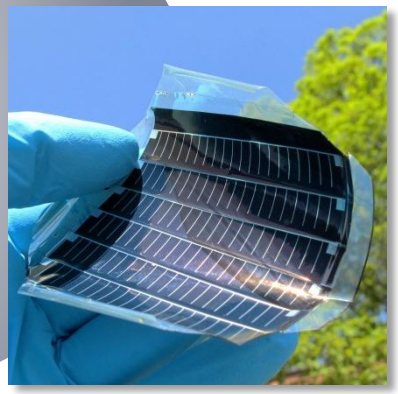
Nano-structured
Materials



Natural Resources
& Pollutants

Analytics

Sustainable Built
Environment



Energy

# Empa Organigramme

Empa
Materials Science and Technology

www.empa.ch

## RESEARCH FOCUS AREAS
(Research priorities)

**Nanostructured Materials**
Dr Pierangelo Gröning

**Sustainable Built Environment**
Dr Tanja Zimmermann
Prof. Dr Giovanni Terrasi

**Health and Performance**
Prof. Dr Alex Dommann

**Natural Resources and Pollutants**
Dr Brigitte Buchmann

**Energy**
Dr Peter Richner
Urs Elber

## BOARD OF DIRECTORS

| Director general | Deputy | Members |
|---|---|---|
| Prof. Dr Gian-Luca Bona | Dr Peter Richner | Dr Brigitte Buchmann \| Prof. Dr Alex Dommann \| Dr Pierangelo Gröning \| Dr Urs Leemann \| Dr Tanja Zimmermann |

## DEPARTMENTS

### Advanced Materials and Surfaces
Dr Pierangelo Gröning

**Electron Microscopy Center**
Dr Rolf Erni

#### LABORATORIES

**Joining Technologies and Corrosion**
Dr Lars Jeurgens

**Advanced Materials Processing**
Prof. Dr Patrik Hoffmann

**nanotech@surfaces**
Prof. Dr Roman Fasel

**Mechanics of Materials and Nanostructures**
Dr Johann Michler

**Thin Films and Photovoltaics**
Prof. Dr Ayodhya N. Tiwari

**Functional Polymers**
Prof. Dr Frank Nüesch

### Engineering Sciences
Dr Peter Richner

**Road Engineering / Sealing Components**
Prof. Dr Manfred Partl

**Structural Engineering**
Prof. Dr Masoud Motavalli

**Mechanical Systems Engineering**
Prof. Dr Giovanni Terrasi

**Multiscale Studies in Building Physics**
Prof. Dr Dominique Derome

**Mechanical Integrity of Energy Systems**
Prof. Dr Edoardo Mazza

**Center for Synergetic Structures**
Dr Rolf Luchsinger (PPP Empa – Festo)

**Urban Energy Systems**
Viktor Dorer

### Materials Meet Life
Prof. Dr Alex Dommann

**Center for X-ray Analytics**
Dr Antonia Neels

**Electronics & Reliability Center**
Prof. Dr Alex Dommann

**Nanoscale Materials Science**
Prof. Dr Hans Josef Hug

**Biomimetic Membranes and Textiles**
Prof. Dr René Rossi

**Particles-Biology Interactions**
Dr Peter Wick

**Biointerfaces**
Dr Katharina Maniura

**Transport at Nanoscale Interfaces**
PD Dr Michel Calame

## RESEARCH, KNOWLEDGE AND TECHNOLOGY TRANSFER PLATTFORMS

**NEST**

**move**

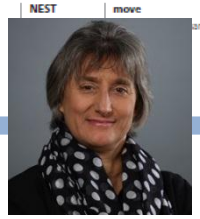
**ehub**
Philipp Heer

**Coating Competence Center**
Dr Lars Sommerhäuser

**Empa Academy**
Anja Pauling

**Business Incubators**
**glaTec**
Mario Jenni
**STARTFELD**
Peter Frischknecht

**International Research Cooperations**
Prof. Dr Gian-Luca Bona



### Mobility, Energy and Environment
Dr Brigitte Buchmann

**Materials for Energy Conversion**
Dr Corsin Battaglia

**Advanced Analytical Technologies**
Prof. Dr Davide Bleiner

**Air Pollution / Environmental Technology**
Dr Lukas Emmenegger

**Automotive Powertrain Technologies**
Christian Bach

**Materials for Renewable Energy**
Prof. Dr Andreas Züttel (Antenna Sion)

**Technology and Society**
Dr Patrick Wäger

**Acoustics / Noise Control**
Kurt Eggenschwiler

### Functional Materials
Dr Tanja Zimmermann

**High Performance Ceramics**
Prof. Dr Thomas Graule

**Applied Wood Materials**
Prof. Dr Ingo Burgert (a.i.)

**Concrete / Construction Chemistry**
Prof. Dr Pietro Lura

**Building Energy Materials and Components**
Dr Matthias Koebel

**Advanced Fibers**
Prof. Dr Manfred Heuberger

### Support
Dr Urs Leemann

**Library (Lib4RI)**
Dr Lothar Nunnenmacher

**ICT-Services**
Stephan Koch

**Mechanical Engineering / Workshop**
Stefan Hösli

**Finances / Controlling / Purchasing**
Heidi Leutwyler

**Communication**
Dr Michael Hagmann

**Human Resources**
André Schmid

**Marketing, Knowledge and Technology Transfer**
Gabriele Dobenecker

**Real Estate Management**
Hannes Pichler

## Research Commissions

**National**
Dr Urs Düng, IBM, Rüschlikon
Prof. Dr Rik Eggen, Eawag, Dübendorf
Prof. Dr Thomas Egli, Emeritus
Dr Karl Knop, Zurich
Prof. Dr Dimos Poulikakos, ETH, Zurich
Prof. Dr Marcus Textor, ETH, Zurich
Prof. Dr Alexander Wokaun, PSI, Villigen

**Internal**
Dr Pierangelo Gröning (Chair)
Dr Georg Spescha (Manager)
Dr Andrea Bergamini
Dr Thomas Geiger
Dr Erwin Hack
Dr Dirk Hegemann
Dr Bernd Nowack
Dr Dorina Opris
Dr Daniele Passerone
Dr Stefan Reimann
Dr Patrik Soltic

September 2017

## Industrial Advisory Board

Dr Henning Fuhrmann, Siemens, Zug (Chair)
Dr Kurt Baltensperger, ETH Board, Zurich
Prof. Dr mult. hc Robert Frigg, 41medical, Bettlach
Dr Andreas Hafner, BASF, Basel
Dr Markus Hofer, Bühler, Uzwil
Dr Peter Kupferschmied, Meggitt Sensing Systems, Fribourg
Dr Urs Mäder, SATW, Zurich
Dr Markus Oldani, GE Power, Baden
Dr Andreas Schreiner, Novartis, Basel
Dr Eugen Voit, Leica Geosystems, Heerbrugg

## Empa Portal

portal@empa.ch
Phone +41 58 765 44 44
www.empa.ch/web/empa/empa-portal

# Empa Building Bridges

Empa
Materials Science and Technology

**Academia**

**Government,**
**Federal Offices**

**Empa**

**Methods or Systems**
**at**
**Incubation Stage**
**with**
**Potential for Technology Transfer**

**Industry**

**Society**

# Select R&D-Projects
## Synthesis of Structurally Pure Carbon Nanotubes

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- «Growth» of Single-wall Carbon Nanotubes (CNT) with Predefined Structure
- Structure Determined by Starting Material (Seed)
- => Identical Electronic Properties (for Ultra-sensitive Light Detectors & Nano-transistors)
- Nature Cover, 7 Aug 2014

# R&D-Projects with Partners from Industry
## For Switzerland as a Workplace

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**Are You In?**

# Select R&D-Projects
## Modular Building Lab «NEST»

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NEST | Empa eawag

# Select R&D-Projects

## Future Mobility Demonstrator «move»

From «green electricity» to sustainable fuels

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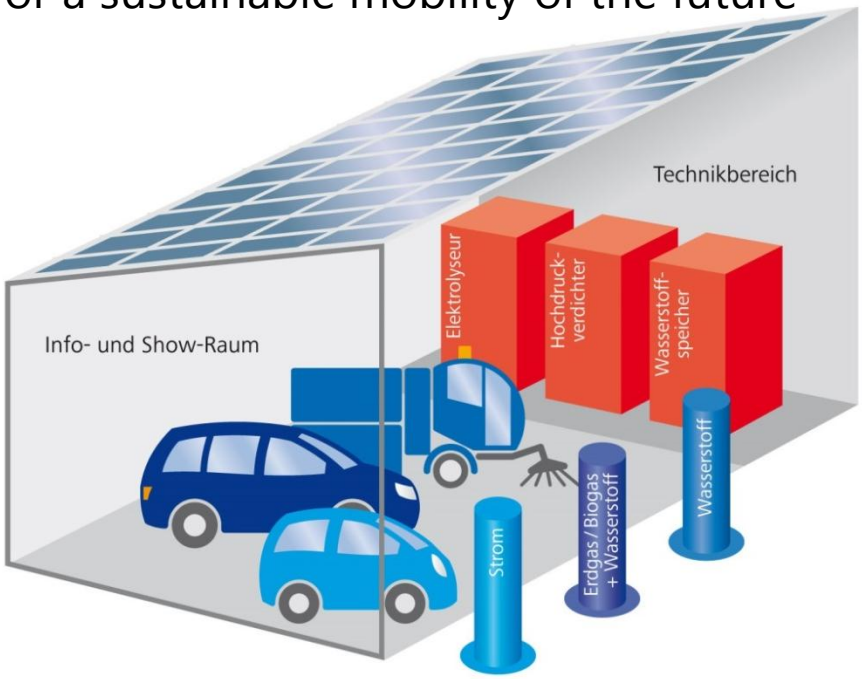
move | Empa

## Platform for Technology Transfer

Using excess electricity in a decentralized way for a sustainable mobility of the future




Fuelling Capacity

| | |
|---|---|
| Hydrogen cars | ca. 5 a day |
| Gas cars (10 vol-% $H_2$) | ca. 70 a day |
| Gas cars (25 vol-% $H_2$) | ca. 30 a cay |

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Bundesamt für Energie BFE

ETH-RAT

PAUL SCHERRER INSTITUT PSI

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

zhaw

Glattwerk

FPT POWERTRAIN TECHNOLOGIES

DIE POST

Stadt Dübendorf

FOGA

# Our Data Supporting the Federal Administration

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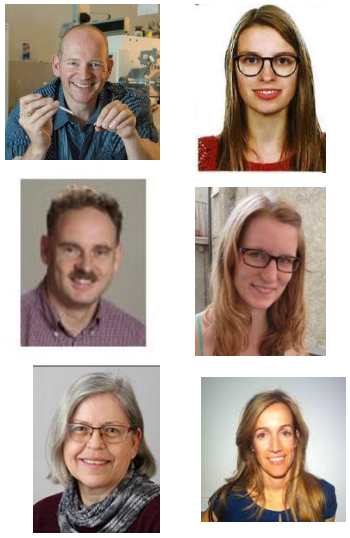
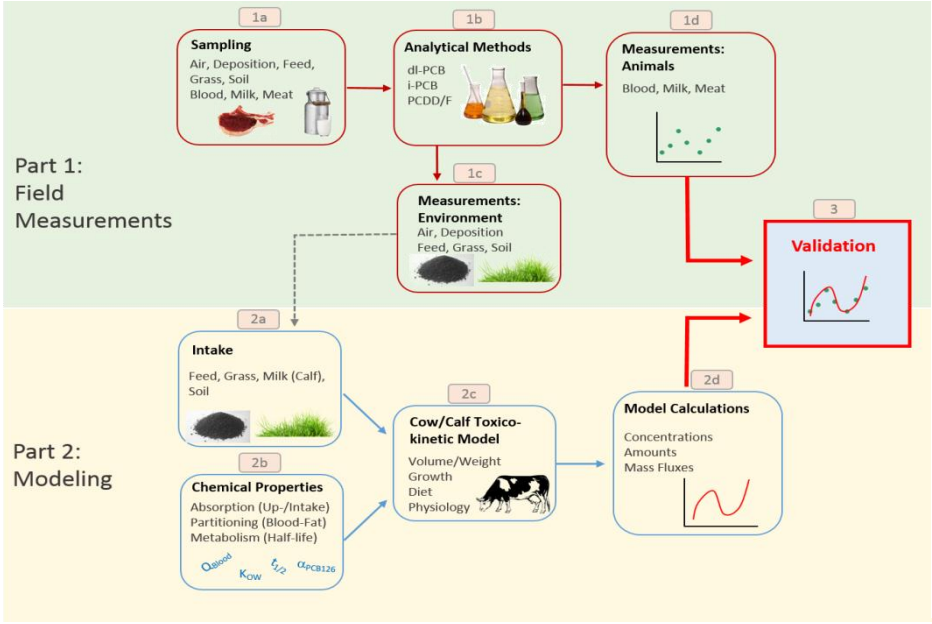
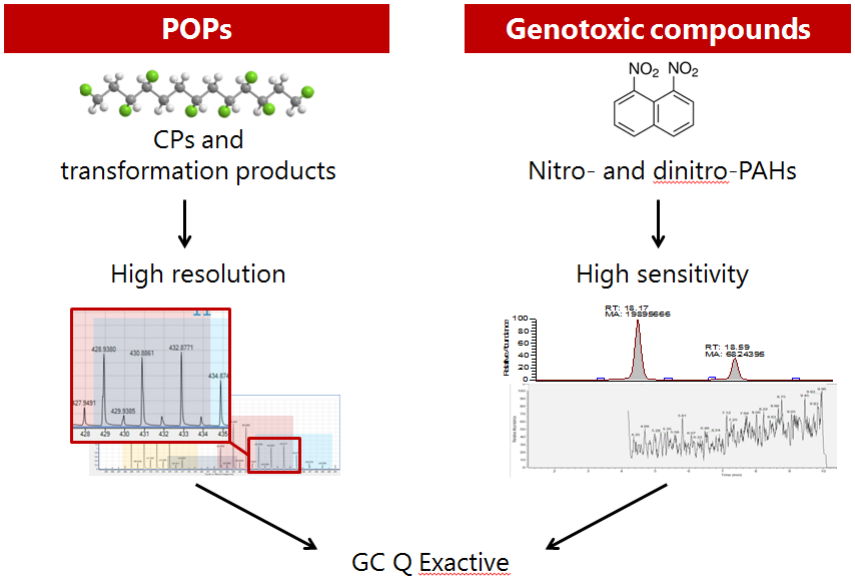


- Fuel-Dependent Aircraft Emissions (BAZL)
- AgroPOP: PCB in the Farming Cycle (BLV)
- CP-TOP: Cl-Paraffins of Industrial By-Products (BAFU)
- Nitro and Dinitro PAHs (BAFU)



# Polycyclic-Aromatic Hydrocarbons in GDI Exhausts

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with J. Czerwinski (FH Bern)

Atmospheric Environment 178 (2018) 242–254

Contents lists available at ScienceDirect

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journal homepage: www.elsevier.com/locate/atmosenv

Co-formation and co-release of genotoxic PAHs, alkyl-PAHs and soot nanoparticles from gasoline direct injection vehicles

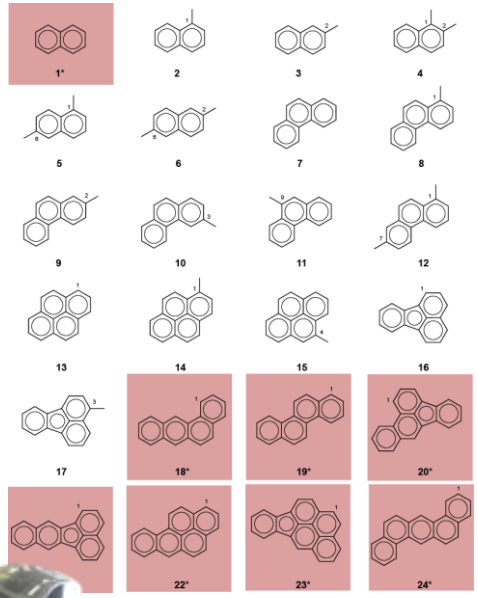
Maria Muñoz[a,*], Regula Haag[a], Peter Honegger[b], Kerstin Zeyer[b], Joachim Mohn[b], Pierre Comte[c], Jan Czerwinski[c], Norbert V. Heeb[a]

[a] Laboratory for Advanced Analytical Technologies, Empa, Swiss Federal Laboratories for Materials Science and Technology, Überlandstrasse 129, CH-8600, Dübendorf, Switzerland
[b] Laboratory for Air Pollution/Environmental Technology, Empa, Swiss Federal Laboratories for Materials Science and Technology, Überlandstrasse 129, CH-8600, Dübendorf, Switzerland
[c] Laboratory for Exhaust Emission Control, UASB, University of Applied Sciences Bern, Gwerdtstrasse 5, CH-2560, Nidau, Switzerland

Norbert Heeb

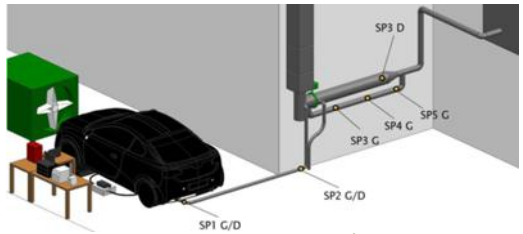
Maria Munoz-Fernandez

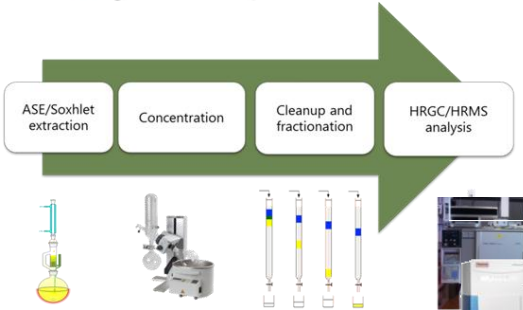
## Genotoxic PAH highlighted

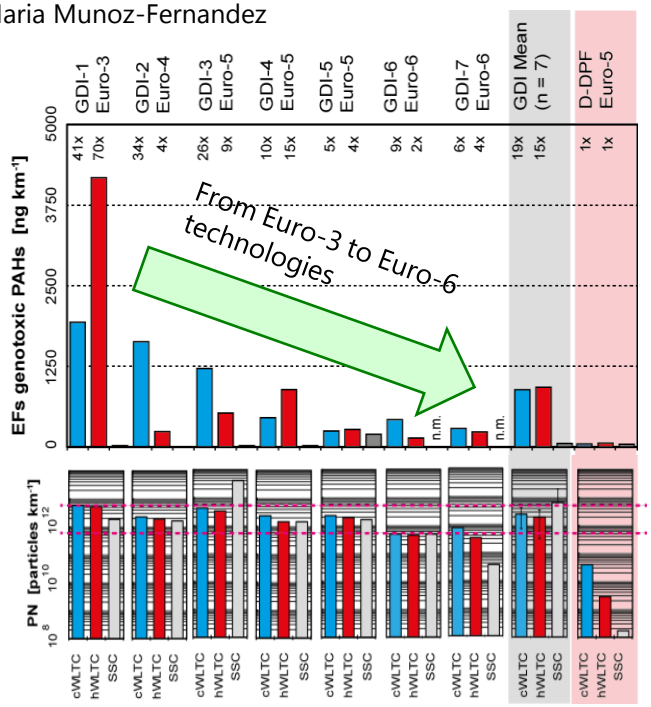



## Sampling and Analysis

GDI Fleet n =7




- Secondary Emissions from New Technologies of Exhaust Handling:
  - Oxicat,
  - DPF, GPF,
  - NOx-Trap,
  - SCR
- Detailed Chemical Mechanisms
- More Synergies with 504