SFA-AM CB & TP @ ETH Zurich

January 2020
# ETHZ Competences in Additive Manufacturing (AM)

Over 35 ETHZ research groups are active in AM

### Materials (development, qualification, testing)
- BAUG Flatt
- HEST Zenobi-Wong
- MATL Spolenak, Löfler
- MATL Studart
- MAVT Ermanni, Shea
- MAVT Mohr
- MAVT Wagener
- inspire icams

### Processes & Machinery
- MAVT Ermanni
- MAVT Mohr
- MAVT Wagener
- inspire icams

### Architecture & Construction
- ARCH Dillenburger, Block
- ARCH Gramazio & Kohler
- BAUG Flatt, Habert, Vassiliou

### Design & Product Development
- ARCH Block, Dillenburger, Gramazio & Kohler
- HEST Ferguson, Müller, Zenobi-Wong
- INFK Coros, Sorkine-Hornung
- MAVT Meboldt, Shea
- inspire pdz

### Data, Computational Methods & Simulation
- ARCH Block, Dillenburger, Gramazio & Kohler
- INFK Coros, Hilliges, Sorkine-Hornung
- MAVT Kochmann, Mazza, Mohr
- MAVT Meboldt, Shea
- MAVT Wagener

### Economics (business models & supply chains)
- MAVT Meboldt
- MTEC Brusoni
- inspire pdz

### Bioprinting, (Bio)MedTech, Food & Pharma
- CHAB Leroux
- CHAB delMello, Stark
- HEST Ferguson, Müller, Zenobi-Wong
- HEST Windhab
- ITET Vörös & Zambelli
- MATL Studart
- MAVT Mezz, Meboldt
- MAVT Tisbi

### Small-Scale AM (nano & micro)
- BAUG Wang
- CHAB delMello
- HEST Ferguson, Müller, Zenobi-Wong
- ITET Vörös & Zambelli
- MATL Isa, Spencer
- MATL Spolenak
- MAVT Dml, Hierold, Nelson, Poulikakos
- MAVT Kochmann, Mohr

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**Publications:**

MaP Competence Center for Materials and Processes

**ETH Spin-Offs:**

spectroPLAST

additively

CYTOSURG

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SFA Manufacturing CB & TP – update 2020

- faculty hire Prof ‘Advanced Manufacturing’ at D-MAVT
- first candidates started in ETH Sabbatical | CAS AMaP programme
- in 2019, 3rd edition of MaP AM Lecture Series (with another increase in number of participants compared to previous editions in 2016/17)
- dialogue with society at Treffpunkt Science City Spring 2019 on ‘the perfect material’ & public outreach in ETH GLOBE ‘new materials’ (issue 4/2019)
Professorship for Advanced Manufacturing  01.02.2020

Prof. Dr.-Ing. habil. Markus Bambach  mbambach@ethz.ch

Profile:
■ Diploma in Materials Science
  Saarland University Germany (2002)
■ Doctorate in Rapid Prototyping of Sheet Metal
  RWTH Aachen University (2007)
■ Habilitation / Venia Legendi in Materials Technology and Shaping
  RWTH Aachen University (2014)

Previous positions:
■ Brandenburg University of Technology (2015-2020)
  ■ Full Professor (W3) for Mechanical Design and Manufacturing
  ■ CEO Panta Rhei gGmbH, lightweight materials research center
  ■ Coordinator of 3DLAB (15m€ research lab for additive manufacturing)
■ RWTH Aachen (2005-2015)
  ■ Chief engineer, metal forming institute
  ■ Coordinator of the research domain “Integrated Technologies” in the
    Aachen Cluster of Excellence for Production
Professorship for Advanced Manufacturing

Research Interests

Selective Laser Melting:
- Multi-Laser Processes
- Temperature and property control
- High-temperature materials
- AI-assisted process control

Laser Metal Deposition:
- Diode Laser system with 6 x 200 W
- Shapeable laser spot
- Coaxial feed of powder, wire and hot wire
- Superior gas shielding
Professorship for Advanced Manufacturing

Research Interests

**Wire-Arc Additive Manufacturing:**
- Printing of large-scale structures
- Temperature & distortion control
- AI-assisted path planning

**Materials:**
- High-temperature materials (Ti-, Ni-, Fe-based intermetallics)
- High Entropy Alloys
- Lightweight Materials (Next Generation Scalmalloy)
- Advanced Steels
- Computational Materials Development

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1st Additive Manufacturing (AM) Mini-Symposium / Pitch Event

- AM capacity buildup & fostering collaborations across ETHZ
  - under auspices of Ch. Hierold
  - in collaboration with pd | z (M. Meboldt)
- 36 short talks (17 groups of 7 departm.): bigger picture & project challenges
- from nano to macro, across materials & processes, for various applications
- 75 participants
3rd MaP Distinguished Lecture Series on ‘Additive Manufacturing’

- expert speaker from academia & industry
  - across materials classes & processes
  - from health to automotive to architecture
  - tailored meeting programme at ETH
- interdisciplinary audience of over 50 participants
  - from all over CH
  - platform for ETHZ AM Interest Group
MaP Distinguished Lecture Series ‘Additive Manufacturing’

Interdisciplinary lecture series with internationally renowned speakers from academia & industry working at the frontiers of AM

- from nano to macro, across materials classes (biomaterials to ceramics & metals) and processes, different applications

- over 50 participants from all-over Switzerland: academia & industry

→ platform to exchange within the ETHZ AM Interest Group
additivETH 2019

SAMPE-MaP Technical Conference ‘AM of Lightweight Composites’

- from fundamentals of materials, to design, series production & applications
- 9 expert contributions from industry, academia & start-ups
- 85 industrialists & researchers from all over Europe
- in collaboration with Swiss SAMPE & NTN Carbon Composites Schweiz
additivETH 2018/19

Further AM Activities at ETH Zurich

11.04.18  1st AM Mini-Symposium / Pitch Event
07.05.18  AM Talk by Prof. Julia Greer (Caltech)
27.-31.08.18  1st AMB Summer School on ‘AM & Biofabrication’
25.10.18  AM Talk by Prof. Michele Miragoli (University of Parma)
12.12.18  IWF-Kolloquium ‘AM für grosse Bauteile’
16.01.19  Joint SAMPE-MaP Technical Conference ‘AM of Lightweight Composites’
14.02.19  pd|z AM Day on ‘Der Weg zum additiven Serienprodukt’
          FS 19  3rd MaP AM Lecture Series
24.10.19  pd|z – AM Network Tagung ‘AM in Forschung & Praxis’

spring 20  launch additivETH Silicone AM Platform
FS 20  4th MaP AM Lecture Series
fall 20  2nd AMPA International Conference ‘AM in Products & Applications’
additivETH Silicone AM Platform & Technology Demonstrators

**aim:** realising the potential of AM of soft materials for soft robotics & personalised medical technologies

→ enhance ETHZ’s leading role at interface of adv. manufacturing, robotics & personalised medicine

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<th>2020 (Q1)</th>
<th>setting-up of a pilot-scale technology &amp; knowhow platform for the AM of soft materials that builds on existing ETH technology</th>
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<td>2020 (Q2) – 2021 (Q1)</td>
<td>realisation of additivETH demonstrators within 12 months by an initial group of researchers from MaP PIs, supported by community building activities</td>
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<td>2021 (Q1/2)</td>
<td>effective presentation of demonstrators geared towards our partners in industry, clinics and media, to enhance the recognition of ETHZ’s leading role in this area</td>
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<td>2021 (Q2) – 2022 (Q2)</td>
<td>rollout (technology platform + initial users) to whole ETHZ AM community + realisation of additional demonstrators (open call for MaP PIs)</td>
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This project is supported by Huber & Suhner and the ETH Zürich Foundation

Kick-off with 6 PIs on 27 Jan 2020

29.01.2020 Kick-off with 6 PIs on 27 Jan 2020

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Lifelong Learning for Sustainable Manufacturing Innovations

ETH Sabbatical | CAS in Advanced Materials and Processes

- customised programme along individually-specified focus area
- developed in collaboration with industry partners of ETHZ
- personal coaching by MaP professor
- access to latest ETHZ research infrastructure
Thank you for your interest