



Topical workshop

Bioinspired adhesion:  
from geckos to new products?

July 7 -9, 2010

INM - Leibniz Institute for New Materials, Saarbrücken, Germany



Understanding biological attachment systems and emulating them in the laboratory has become a strong research activity worldwide. Many questions remain: What is the state of understanding reached? How should artificial systems be fabricated to achieve optimum performance? How can we compare adhesion data from different labs? What are possible routes for low-cost production? And, finally, which applications exist or are appearing on the horizon?

This invitation-only workshop will aim to discuss issues of common interest among these groups. Topics to be covered will be: i) The bio example, ii) Artificial adhesion systems, iii) Test methods for adhesion, iv) Progress in contact mechanics, v) Outlook on applications.

The workshop will be organized by Eduard Arzt and Marleen Kamperman (INM). It will be held at INM Leibniz Institute for New Materials in Saarbruecken, Germany - a lively town on the French border. Saarbruecken can be easily reached from Frankfurt Airport (2 hours by car or train) or Paris Airport (2.5 hours by train). Participation will be limited to 50.

[This workshop is kindly supported by the VolkswagenStiftung.](#)

## Tuesday, July 6 - Arrival

20:00 Informal get-together in Leidinger hotel (downtown Saarbrücken)

## Wednesday, July 7

09:00 – 10:00 registration and coffee

10:00 Welcome: **Eduard Arzt**

### Session 1: Bio example: Investigation of natural attachment systems

Session chair: **Eduard Arzt** (INM, Germany)

10:15 – 11:00 **Walter Federle** (University of Cambridge, UK)  
*Insect adhesive systems: structure and function*

11:00 – 11:45 **Kellar Autumn** (Lewis & Clark College, USA)  
*Principles of gecko adhesion and their application in gecko-like synthetic adhesives (GSAs)*

11:45 – 12:30 **Paolo Decuzzi** (University of Texas at Austin, USA)  
*The role of nanogeometry in bioadhesion*

12:30 – 14:00 lunch

### Session 2: Design and synthesis of artificial adhesion systems

Session chair: **Aranzazu del Campo** (MPI, Mainz, Germany)

14:00 – 14:45 **Metin Sitti** (Carnegie Mellon University, USA)  
*Design, manufacturing, and applications of mushroom-shaped micro-fibrillar adhesives*

14:45 – 15:30 **Kaph-Yang Suh** (Seoul National University, S-Korea)  
*Design and fabrication of high-performance gecko adhesives by various nanofabrication methods*

15:30 – 16:00 coffee

16:00 – 16:45 **Ron Fearing** (University of California, Berkeley, USA)  
*Geometry issues for hard polymer fibrillar adhesives*

16:45 – 17:30 **Kimberly Turner** (University of California at Santa Barbara, USA)  
*Development of reversible gecko-inspired adhesives*

17:30 – 20:00 POSTER SESSION

## Thursday, July 8

### Session 3: Test methods for adhesion: towards convergence of testing methodology

Session chair: Ralph Spolenak (ETH, Zürich)

09:00 – 09:45 Anand Jagota (Lehigh University, USA)

*Adhesion, compliance, and frictional properties of a film-terminated fibrillar interface*

09:45 – 10:30 Alfred Crosby (University of Massachusetts, USA)

*Beyond setae: using wrinkles and fundamental scaling to guide design*

10:30 – 11:00 coffee

11:00 – 11:45 Animangsu Ghatak (IIT Kanpur, India)

*Role of sub-surface microstructures on bio-inspired adhesion*

11:45 – 12:30 Anke Lindner (ESPCI - University Paris, France)

*Adhesion on rough surfaces: the role of viscoelasticity*

12:30 – 14:00 lunch

Free afternoon for informal discussions

19:00 Conference dinner – “Stiefelbräu” Saarbrücken

([http://www.stiefelgastronomie.de/frameset\\_stiefelbraeu.htm](http://www.stiefelgastronomie.de/frameset_stiefelbraeu.htm))

## Friday, July 9

### Session 4: Progress in contact mechanics: Modelling and simulation of bioadhesion

Session chair: Robert McMeeking (University of California at Santa Barbara, USA)

09:00 – 09:45 Huajian Gao (Brown University, USA)

*Some viewpoints on mechanical principles of gecko adhesion*

09:45 – 10:30 Bo Persson (IFF, Research Institute Jülich, Germany)

*Leak rate of seals: theory and experiment*

10:30 – 11:00 coffee

#### Session 5: Design and synthesis of artificial adhesion systems

Session chair: Karin Jacobs (Saarland University, Germany)

11:00 – 11:45 Eduard Arzt (INM, Germany)

*Bioinspired reversible adhesives by micro- and nanopatterning techniques*

12:00 – 13:30 lunch

13:30 – 14:15 Dai Zhendong (Nanjing University of Aeronautics and Astronautics, China)

*From locomotion dynamics to bio-inspired gecko-mimicking robot*

14:15 – 15:00 Christophe Poulard (University Paris, France)

*Mechanisms of adhesion enhancement of micropatterned interfaces*

15:00 – 15:30 coffee

#### Session 6: Outlook on applications

Session chair: Marleen Kamperman (INM, Germany)

15:30 – 16:15 Yohei Maeno (Nikko Denko Corporation, Japan)

*CNT design for high gecko adhesion*

16:15 – 17:00 Mike Northen (North Design Labs, USA)

*Realities of human scaling*

17:00 closings

#### Venue:

INM – Leibniz-Institut für Neue Materialien gGmbH

Campus D2 5

5. Stock, Leibniz-Saal

66123 Saarbrücken

#### Contact:

Marleen Kamperman

INM – Leibniz-Institut für Neue Materialien gGmbH

Phone: +49 (0)681 9300 414

Email: [Marleen.kamperman@inm-gmbh.de](mailto:Marleen.kamperman@inm-gmbh.de)

