**Laboratory for Micro-Optics**

**Prof. Hans Zappe**

**Research Area**
Tissue optics

**Relevant Tasks**
- ☒ Optical experiments
- ☒ Test setup development
- ☒ Device characterization
- ☒ Material characterization
- ☐ Optical simulations
- ☐ FEA simulations
- ☐ Clean room fabrication
- ☒ CAD/CAM
- ☒ Polymer fabrication
- ☐ Programming
- ☒ Analytical analysis / Theory
- ☒ Literature research
- ☐ Teaching

**Eligible Departments**
- ☒ Microsystems technology
- ☒ Mechanical engineering
- ☒ Process engineering
- ☐ Chemistry
- ☐ Physics
- ☐ Electronics and IT
- ☐ Computer science
- ☐ Industrial engineering

**Starting Date**
Immediately

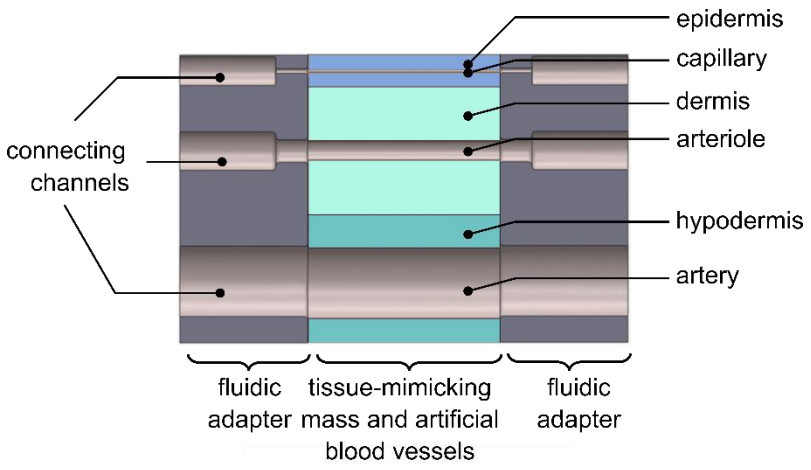
**Working Language**
German or English

**Contact Person**
Sophie Jenne
Room: 102 02-079
Tel: 0761/203-7518
sophie.jenne@imtek.de

# Bachelor's Thesis

## Optical tissue phantom

For the development and routine characterization of optical devices used in medicine, tissue-equivalent phantoms mimicking a broad spectrum of human skin properties are indispensable.
The Laboratory of Micro-optics recently developed a tissue-equivalent phantom suitable for photoplethysmography applications. The phantom comprised the optical and mechanical properties of the three uppermost human skin layers and the respective blood vessels. Therefore, the mechanical properties of the polydimethylsiloxane base material were adjusted by different mixing ratios of a base and curing agent, the optical properties were tuned by adding titanium dioxide particles, India ink, and synthetic melanin in different concentrations. The layered structure of the phantom was realized using a doctor blade technique, and blood vessels were fabricated using molding wires of different diameters. After the integration of the tissue-phantom into an artificial circulatory system by using fluidic adapters, we were able to achieve a time-dependent expansion of the artificial blood vessels.




For a new application scenario, we are now looking for a highly motivated Bachelor student that will adapt the existing tissue phantom. Modifications include the change of the phantom geometry by increasing the layer thicknesses, the design of a new fluidic adapter and the characterization of the new tissue phantom.

The project duration will be 3 months.

If you are interested in further information, please contact Sophie Jenne.