Brandenburgische Technische Universität Cottbus - Senftenberg

Fakultät 1
Institut für Physik

Invitation to the Physics Special Colloquium

Lecturer:

Prof. Dr. Shanti Bhattacharya
University of Madras, Chennai

Topic:

"Metaoptics for microendoscopy"

High-resolution optical imaging inside the body requires probes that are not only compact and minimally invasive but also capable of maintaining image quality across the entire field of view. Scanning fiber endoscopes are attractive for this purpose because they can provide micron-scale resolution in a very small form factor, making them well suited for in-vivo imaging. However, their performance is often limited by off-axis aberrations that degrade resolution toward the edges of the image. In this work, we address this challenge by integrating a metasurface with a conventional GRIN micro-lens to create a hybrid optical system for confocal endoscopy. Using a combined macro- and nanoscale optical design workflow, we show that a thin metasurface can serve as a compact method of aberration-correction, significantly improving image quality. We first demonstrate this approach in scanning fiber confocal reflectance imaging, achieving nearly uniform resolution across the field of view. We then extend the concept to fluorescence imaging, showing that high-quality performance can be achieved without conventional achromatic correction by optimizing excitation and emission wavelengths for different focal planes. These results establish metasurface-integrated micro-optics as a powerful strategy for overcoming key limitations of scanning fiber endoscopy while simplifying optical design and enabling higher-performance miniature imaging systems.

Date: Tuesday, 23.06.2026
Time: 03:30 p.m.
Location: VG1C, room 0.01

Im Auftrag von Prof. Flege - Stefanie Jannasch

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