# Session 19 Overview:
# *Optical Systems for Emerging Applications*

## TECHNOLOGY DIRECTIONS SUBCOMMITTEE

**Session Chair:**
Munehiko Nagatani
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**Session Co-Chair:**
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**Session Moderator:**
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Optical technologies bring a new sensing and actuation modality critical to several emerging applications. The papers in this session demonstrate the progression of such technologies for increased robustness and system-level integration. The co-integration of optical and photonic technologies with CMOS offers advancements in application domains such as automation/autonomy and biomedical. This session demonstrates the proliferation of different technologies including silicon-photonics, MEMS and flexible electronics.

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9:15 AM

**19.1 Optical Phased-Array FMCW LiDAR with On-Chip Calibration**

*SungWon Chung, University of Southern California, Los Angeles, CA*

In Paper 19.1, University of Southern California describes a 256-element optical phased array for FMCW lidar with on-chip self-calibration capability. The FMCW lidar consists of an optical front-end chip in 220nm silicon-photonics technology and two 180nm CMOS chips each with 136 Class-D pulse-width modulation (PWM) drivers that time-share a 10b current-steering DAC.

9:23 AM

**19.2 A Mechanically Flexible Implantable Neural Interface for Computational Imaging and Optogenetic Stimulation over 5.4×5.4mm² FoV**

*Sajjad Moazeni, Columbia University, New York, NY and University of Washington, Seattle, WA*

In Paper 19.2, Columbia University demonstrates a mechanically flexible, 250µm thin lens-less neural device with integrated blue and green µLED arrays for fluorescence computational imaging and optogenetic stimulation. This chip achieves 125fps frame-rate with 60µm imaging resolution at 200µm distance consuming 40mW total power.



9:31 AM

**19.3 A MEMS-Based Dynamic Light Focusing System for Single-Cell Precision in Optogenetics**

*Cem Yalcin, University of California, Berkeley, CA*

In Paper 19.3, University of California at Berkeley presents a system for axial light focussing in scan-based optogenetics systems. A 23,852 element MEMS array with phase modulating piston-motion MEMS mirrors achieves a 10kHz frame-rate spatial light modulation by employing a driver ASIC with linearized DACs.