

REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHD-21-05

ULTRAFAST IMAGING: STREAK CAMERA PHOTOGRAPHY FOR VISUALIZING ULTRAFAST CELLULAR DYNAMICS

PROJECT DESCRIPTION: For many full-field imaging techniques, such as fluorescence based microscopy, imaging speeds are often limited by the read-out rate of the charge-coupled device (CCD) or complementary metal oxide semiconductor (CMOS) detector used. While advances in these technologies have allowed for faster image acquisition rates over time, fundamental physical limits in these devices prevent this technology from further increasing imaging speed. This research project will focus on developing novel high speed imaging technologies and applying them to the study of dynamics associated with directed energy exposures. Specific potential research activities may include streak camera microscopy, high-speed quantitative phase imaging, and using strobe photography to study cell membrane voltage dynamics.

ACADEMIC LEVEL: Bachelors, Masters, PhD

DISCIPLINE NEEDED:

- Engineering
 - Bioengineering and Biomedical Engineering
- Physics
 - Applied Physics
 - Optics

RESEARCH LOCATION: JBSA, Fort Sam Houston, San Antonio, TX

RESEARCH ADVISER: Joel N. Bixler, PhD
Biomedical Engineering, Texas A&M University, 2015

Dr. Joel Bixler is a Research Biomedical Engineer in the Optical Radiation Branch at the Air Force Research Laboratory, Airman Systems Directorate. He joined AFRL in 2014 as a Pathways student, and currently works as a principle investigator on an AFOSR funded effort to develop ultrafast imaging systems. He is also the PI on a grant to develop advanced image processing tools for studying retinal laser damage, including the use of machine learning to automate detection and classification of laser damage. Dr. Bixler additionally works with the modeling, simulation, and analysis team to develop improved methods for modeling laser tissue interaction and measuring tissue optical properties.