REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHD-22-01

ADVANCED MICROSCOPY TO DIRECTLY VISUALIZE DIRECTED ENERGY INTERACTIONS WITH CELLS

PROJECT DESCRIPTION: Visualizing directed energy (DE) interactions with tissues and cells can be quite challenging, particularly for short electromagnetic or optical exposures. Many optical techniques can provide high resolution imagery of the interactions, but lack the temporal resolution necessary to visualize the dynamics of an exposure. My research group is focused on adapting advanced microscopy and spectroscopy techniques to understand the fundamental mechanisms of DE interactions. Current research interests include 1) ultrafast imaging to directly study both laser-tissue interaction and pulsed electric field stimulation of cellular membranes, 2) quantitative phase imaging to visualize mass dynamics for cells exposed to DE, and 3) Raman and Brillouin spectroscopy for studying chemical and mechanical changes in response to stimulation. Interns for this topic will have the opportunity to gain experience with these systems, and help develop novel methods for elucidating mechanisms of optical or radiofrequency stimulation of cells and tissues.

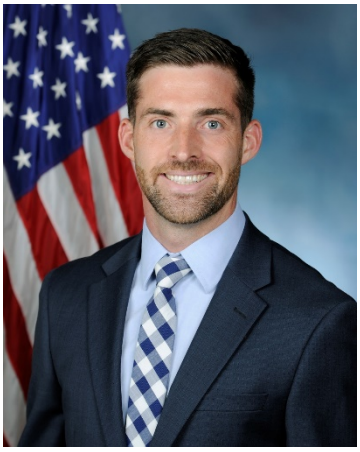
ACADEMIC LEVEL: Masters, PhD

DISCIPLINE NEEDED:

- Biomedical Engineering
- Biology
- Physics

RESEARCH LOCATION: Tri-Service Research Laboratory, JBSA-Fort Sam Houston, San Antonio, TX

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



Joel Bixler is a Research Biomedical Engineer in the Optical Radiation Branch at the Air Force Research Laboratory (AFRL), Airman Systems Directorate. He joined AFRL in 2014 as a Pathways student, and currently works as a principle investigator on a basic research effort to develop ultrafast imaging systems. He is also the principal investigator 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. *Photo courtesy the U.S. Air Force Research Laboratory.*

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