

# REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHB-21-03

## OMICS AND SYNTHETIC BIOLOGY: A SYSTEMS BIOLOGY APPROACH TO HUMAN PERFORMANCE

**PROJECT DESCRIPTION:** The Air Force Research Laboratory is a scientific research organization operated by the United States Air Force Materiel Command dedicated to leading the discovery, development, and integration of aerospace warfighting technologies, planning and executing the Air Force science and technology program, and providing warfighting capabilities to United States air, space, and cyberspace forces.

Multi-omic responses to challenges of AF interest are probed through Next Generation Sequencing (NGS) approaches such as whole genome sequencing, transcriptomics, epigenome profiling etc. to gain a systems level understanding. Synthetic biology is used to engineer rational solutions such as smart probiotics. Projects will expose the intern to areas such as 1) NGS based discovery 2) synthetic biology, 3) novel gene delivery technologies 4) hypothesis driven cell engineering. Data and tools obtained from this effort will be used to develop real world solutions to Air Force / Dept. of Defense challenges and contribute to scientific publications. The intern will have the opportunity to generate hypotheses and test them as well as learn and develop new laboratory and scientific writing/presenting skills.

**ACADEMIC LEVEL:** Bachelors, Masters, PhD

### DISCIPLINE NEEDED:

- Computer, Information, and Data Sciences
  - Artificial Intelligence (including Robotics, Computer Vision, and Human Language Processing)
  - Computer Science (general)
  - Data Science
  - Graphics and Visualization
  - Scientific Computing and Informatics
  - Software Engineering
- Life Health and Medical Sciences
  - Basic Biomedical Sciences
  - Biochemistry
  - Bioinformatics
  - Biology (General)
  - Biophysics
  - Cellular and Molecular Biology
  - Comparative Medicine and Laboratory Animal Medicine
  - Computational Biology
  - Developmental Biology
  - Genetics, Animal and Plant
  - Microbiology
  - Neurosciences
  - Structural Biology
- Nanotechnology
  - Nanotechnology
- Other Physical Sciences
  - Bio-organic Chemistry
  - Biophysical Chemistry

**RESEARCH LOCATION:** Wright-Patterson AFB Dayton, OH

**RESEARCH ADVISER:** Roland Saldanha, PhD  
Microbiology, University of Notre Dame

Dr. Roland Saldanha is a highly experienced molecular biologist/biochemist and is currently the Genomics Lead for the Airman Bioengineering Division of the 711th Human Performance Wing. His prior research has included biochemical and genetic characterization of recombinases, auto-catalytic RNA and novel enzymes encoded by mobile group I and II introns that are central to catalysis and intron mobility. He is co-inventor on two US Patents related to intron based gene disruption technology marketed by Sigma-Aldrich under the trademark TargeTron. He used this technology in studies examining host pathogen interactions in several Tier 1 select agent bacteria at AFRL leading to a US Patent describing attenuated live vaccine strains of *Francisella tularensis*. His current work is focused on uncovering epigenetic markers of AF specific exposures, and using synthetic biology to sense and mitigate AF relevant risks through engineered epigenetic modifications and purpose designed probiotic sense respond circuits.