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RPPR Final Report

as of 30-Jan-2019

Agency Code:

Proposal Number: 70006LSRIP
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Agreement Number: W911NF-17-1-0155

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EIN: 246000376

Report Date: 13-Jul-2018

Date Received: 08-Oct-2018

Final Report for Period Beginning 14-Apr-2017 and Ending 13-Apr-2018

Title: High-Throughput Screening of Evolutionary Biological Materials

Begin Performance Period: 14-Apr-2017

End Performance Period: 13-Apr-2018

Report Term: 0-Other

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Distribution Statement: 1-Approved for public release; distribution is unlimited.

STEM Degrees: 0

STEM Participants: 2

Major Goals: The goal of this project is to establish the genetic basis of fiber forming protein structures via a pioneering high-throughput screening system based on transient thermal-reflectivity (TTR) spectroscopy. This novel method offers the first high-throughput screening tool that reports on the structural features of protein aggregation. Here, we propose to screen an ultra-large number (109) of potential fiber-forming genes. We will achieve the proposed goal by investigating three fundamental questions: (i) what is the underlying sequence-structure relationship for protein aggregation? (ii) what is the complete set of fiber-forming proteins, given that only few have been discovered up to date?; and (iii) how can we uncover new fiber-forming genes in bacterial targets? The proposed approach will generate fundamental knowledge about fiber-promoting genes. Recently, we discovered a new technique to screen protein sequences based ultrafast laser-probing spectroscopy, which has never been applied before in this research domain. Our novel TTR technique enables screening of 10^8 - 10^9 different structural polypeptide sequences for protein aggregates formation in hours, a feat that would be impossible to achieve with existing screening tools such as fluorescence, immunostaining, or functional assays. Successful development of this TTR-based screening approach for proteins will have a significant impact on multiple applications for DoD in various fields (e.g., materials science, agriculture, and medicine) and open new avenues of protein research.

Accomplishments: The DURIP equipment is installed at Earth and Engineering Science Bldg first floor at Room 108, which is a laboratory space available to Dr. Demirel (PI). A pdf document containing the picture of the instrument is uploaded as well.

Currently, we are working towards obtaining data for the protein library. The library project is recently funded by a three year research grant by ARO (W911NF1810261). Hence this instrument is key for the successful completion of the existing research grants.

Training Opportunities: Nothing to Report

Results Dissemination: Nothing to Report

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Honors and Awards: Nothing to Report

Protocol Activity Status:

Technology Transfer: Nothing to Report

PARTICIPANTS:

Participant Type: PD/PI

Participant: Melik Demirel

Person Months Worked: 3.00

Project Contribution:

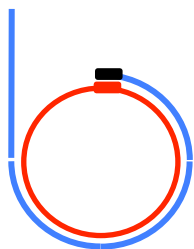
International Collaboration:

International Travel:

National Academy Member: N

Other Collaborators:

Funding Support:

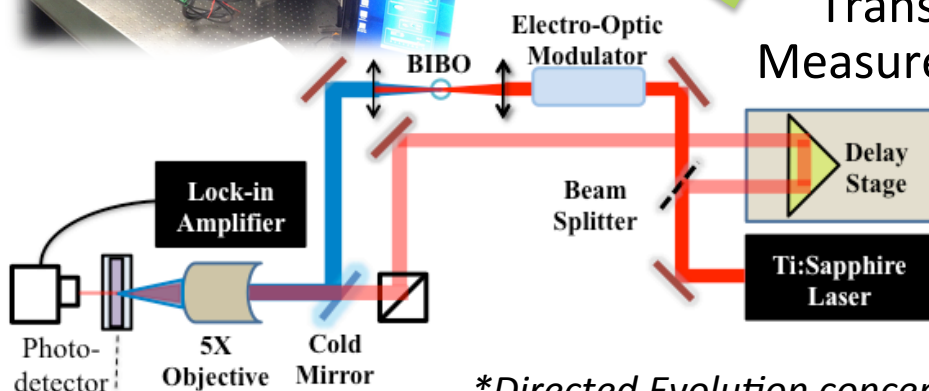
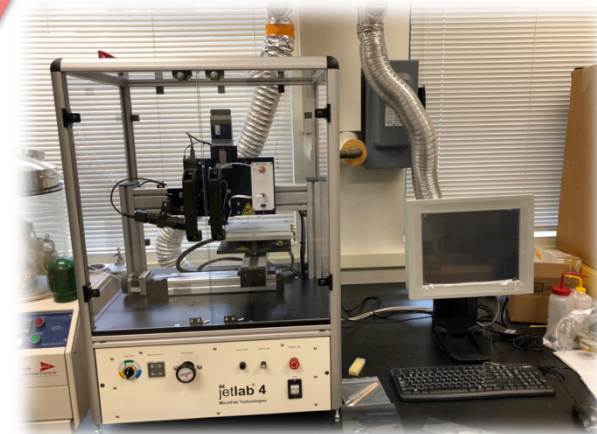
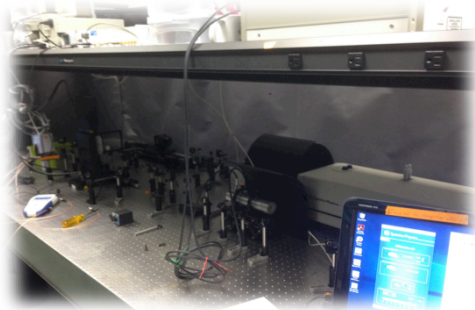
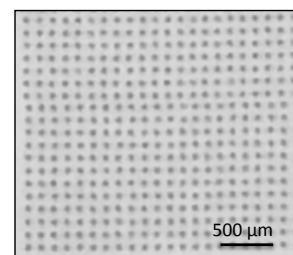


DNA
Library

High-
throughput
Array

*Directed
Evolution of
Assembler
Molecules*

Transient
Measurements



**Directed Evolution concept received Nobel Prize 2018 in Chemistry*