Molecular Information Systems Lab

IARPA MIST Proposers' Day
21 February 2018

Jeff Nivala, Ph.D.
Principal Scientist
University of Washington, Seattle

PAUL G. ALLEN SCHOOL
OF COMPUTER SCIENCE & ENGINEERING

UNIVERSITY of WASHINGTON

Microsoft® Research

Molecular Information Systems Lab

The MISL is a partnership between University of Washington Allen School of Computer Science, Department of Electrical Engineering, and Microsoft Research.

We explore the intersection of information technology and molecular-level manipulation using in-silico and wet lab experiments.

Brings together faculty, students, and research scientists with expertise in computer architecture, programming languages, synthetic biology, and biochemistry.

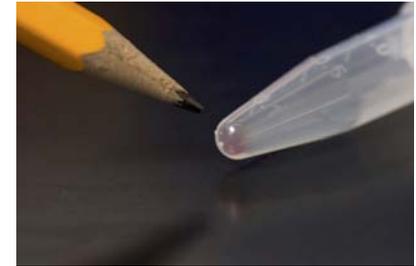Prof. Luis Ceze (UW)
Sr. Rsr. Karin Strauss (Microsoft)
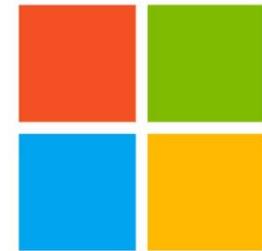
Molecular Information Systems Lab

DNA Storage Architecture and Methods

Currently developing methods for reliable and efficient encoding, random access, and decoding of digital data stored in DNA.
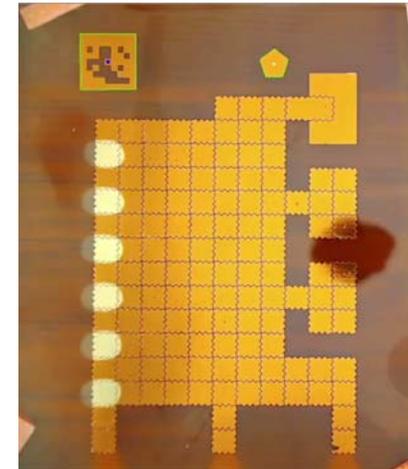

>10 terabytes of data in DNA

Tara Brown/University of Washington

Microfluidic Automation

Currently developing hardware (PurpleDrop) and software (Puddle) aimed to make microfluidic automation cheaper, more reliable, and easier to use.
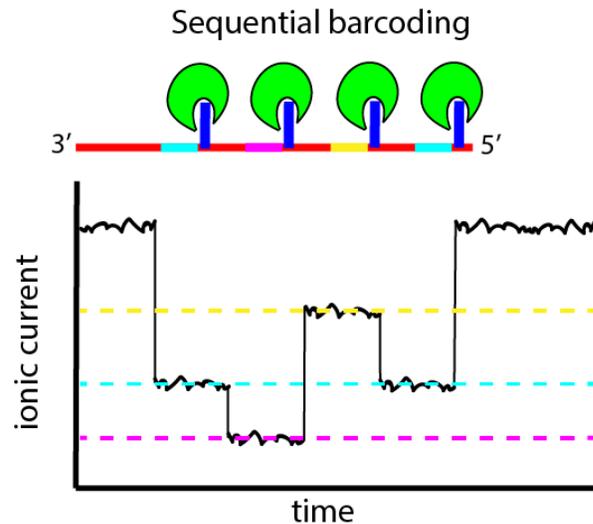

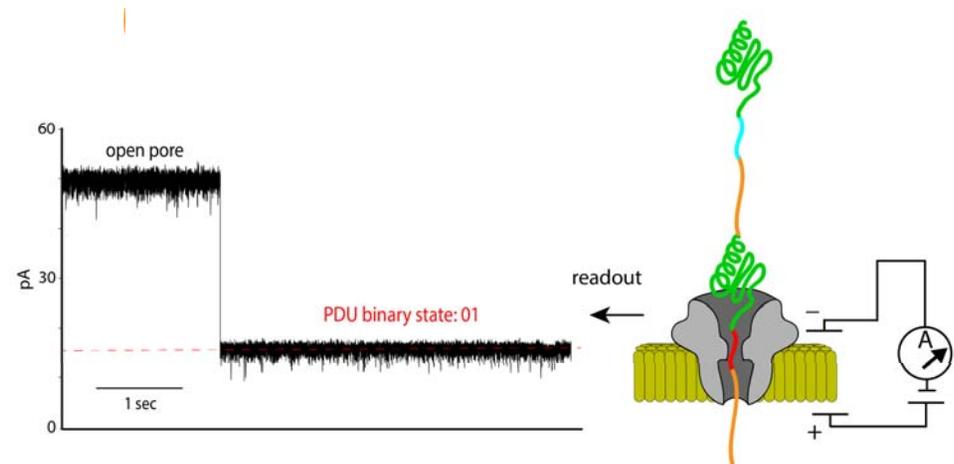PurpleDrop DMF

Molecular Information Systems Lab

TA1 (STORAGE): Novel polymer media and read/write schemes

Experimenting with "nanopore-addressable" barcoded polymers:

synthetic nucleic acid / protein complexes

synthetic polypeptides

Molecular Information Systems Lab

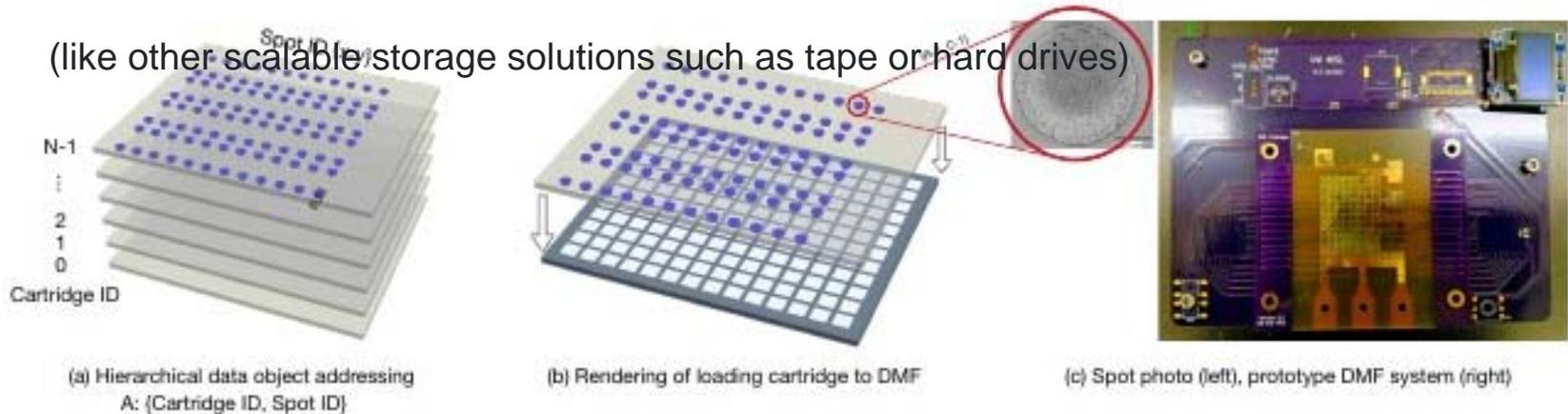## TA2 (RETRIEVAL): 2D DNA Library with Digital Microfluidics Retrieval

A hierarchical DNA storage library architecture:

-physical DNA pools spot-dehydrated on glass "cartridges" for long term storage

-spots can be rehydrated and sampled using digital microfluidics

-cartridges can be organized in a "deck" and accessed using a multidimensional addressing system

(like other scalable storage solutions such as tape or hard drives)

(a) Hierarchical data object addressing
A: {Cartridge ID, Spot ID}

(b) Rendering of loading cartridge to DMF

(c) Spot photo (left), prototype DMF system (right)

Molecular Information Systems Lab

TA3 (OS): Integrated Architecture