



SHYNE
Soft and Hybrid Nanotechnology
Experimental Resource

ILLUMINATE YOUR RESEARCH

Rules of Life (RoL) Research Community (RC)

Vinayak P. Dravid
Coordinator

 National Nanotechnology
Coordinated Infrastructure

The “Other” Rules of Life!

1. LET IT GO

NEVER RUIN A GOOD DAY BY THINKING ABOUT A BAD DAY.

2. IGNORE THEM

DON'T LISTEN TO WHAT OTHER PEOPLE THINK OF YOU. LIVE A LIFE THAT IS EMPOWERING TO YOU.

3. GIVE IT TIME

GIVE IT SOME TIME, TIME HEALS ALL.

4. DON'T COMPARE

DON'T COMPARE YOURSELF; THE ONLY PERSON YOU SHOULD TRY TO BEAT IS THE PERSON YOU WERE YESTERDAY.

5. STAY CALM

STAY CALM AND KNOW THAT ITS OKAY TO NOT HAVE EVERYTHING FIGURED OUT.

6. IT'S ON YOU

YOU ARE IN CHARGE OF YOUR HAPPINESS AND HOW YOUR LIFE TURNS OUT.

7. SMILE

LIFE IS SHORT, ENJOY IT WHILE YOU HAVE IT.

7 RULES OF LIFE



1

Make peace with your past so it does not affect the present.

4

Don't compare your life to others and don't judge them. You have no idea what their journey is all about.



2

What others think of you is none of your business.

5

It's alright not to know all the answers. They will come to you when you least expect it.

3

Time heals almost everything, give it time.

6

You are in charge of your happiness.

7

Smile. You don't own all the problems in the world.

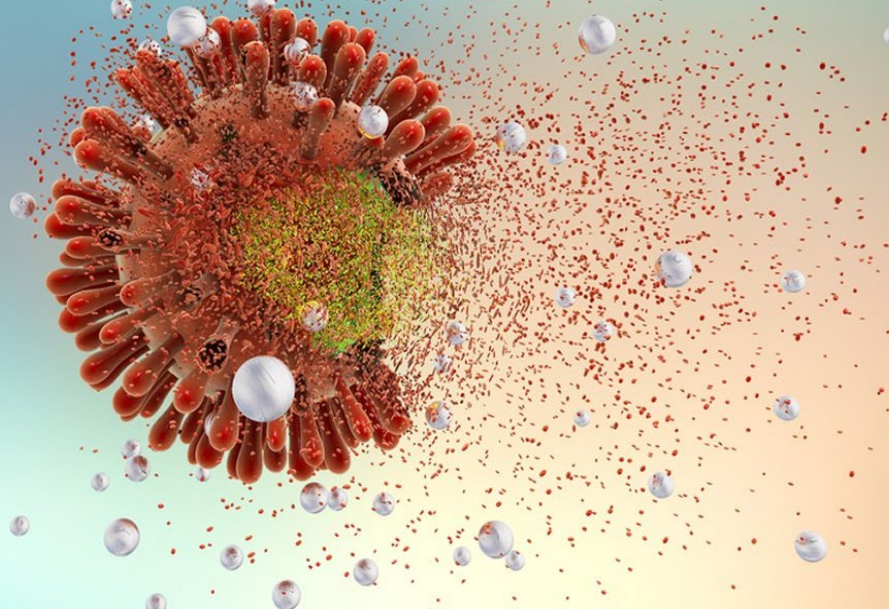
| TheMindsJournal

MINDJOURNAL

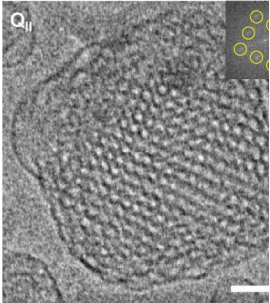
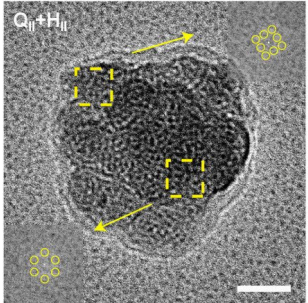
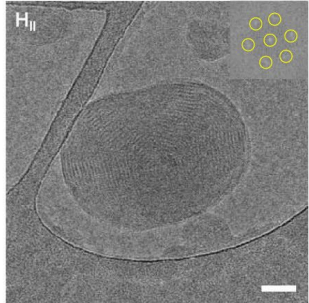
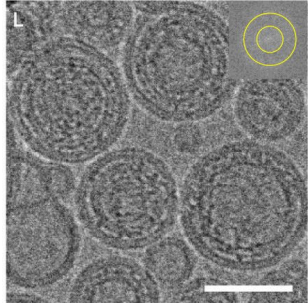
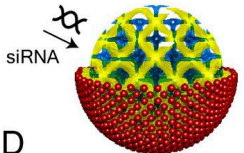
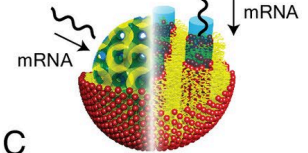
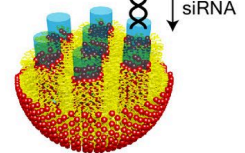
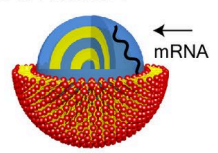
Rules of Life – NSF Perspective

- **To enable discoveries to better understand -- “Rules“ as to how *life* functions**
- **To develop research tools & infrastructure**
 - *To further RoL research*
 - *The capacity to approach more complex questions than ever before;*
- **To train the next generation of researchers to approach scientific inquiry in a way that crosses scales and scientific disciplines related to RoL**
- **Foster collaboration & convergent research crossing multiple levels of organization and complexity in key questions related to “life”.**

The "Real"



Structures of RNA LNPs



Defining & Describing Rules of Life – *NSF Programs*

- ✓ [Understanding the Rules of Life: Emergent Networks \(URoL:EN\) Predicting Transformation of Living Systems in Evolving Environments](#)
(Program Announcement, Feb. 8, 2021)
- ✓ [Understanding the Rules of Life: Microbiome Interactions and Mechanisms \(URoL:MIM\)](#)
(Program Announcement, Nov. 25, 2020)
- ✓ [Understanding the Rules of Life: Epigenetics](#)
(Program Announcement, Nov. 4, 2019)
- ✓ [Understanding the Rules of Life: Epigenetics](#)
(Program Announcement, Sept. 28, 2018)
- ✓ [Understanding the Rules of Life: Building a Synthetic Cell](#)

In-house Reading

[NSF uses Rules of Life research to address societal challenges, from clean water to climate change](#)
(NSF News Release, August 8, 2023)

[Understanding the Rules of Life Program: Scientific Advancements and Future Opportunities](#)
(National Academies of Science, Engineering, and Medicine Publication, July 14, 2023)

[Reflections on the National Science Foundation's Understanding the Rules of Life Program: Proceedings of a Workshop Series](#)
(National Academies of Science, Engineering, and Medicine Publication, July 14, 2023)

[Using the Rules of Life to Address Societal Challenges \(URoL:ASC\)](#)
(Program Announcement, Oct. 31, 2022)

[Outcomes of Workshop Series on Using the Rules of Life to Address Societal Challenges](#)
(Report, Aug. 5, 2022)

Rules of Life – NNCI/Our Perspective

- **Research tools and infrastructure (*Nano for Bio*)**
 - *Metrology in Biology - “Measuring” in bio, and as life connects to the world*
 - *Sensing/diagnostics – integrating nano-bio, cargo/delivery, tissue engg*
 - *Imaging by- and of “Nano-Bio”*

- **Themes of NNCI Interest:**
 - *Synthetic Biology - Imaging tools/methods - AI/ML into RoL*
 - *Specific technical themes:*
 - *Diagnostics & sensing, Imaging*
 - *Unconventional fields: Nano-X (Agriculture, Food, Water etc.)*

- **Vendor/Webinar events, training, outreach..**

- **Other ideas/plans - Continued discussions 2023-24 (Spring '24 Workshop)**



An Assessment of Short-Term Milestones in EBRC's Roadmap, *Engineering Biology*

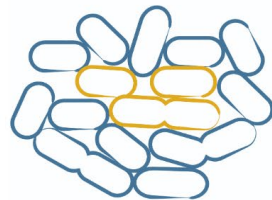
[VIEW THE ASSESSMENT](#)

EBRC Technical Roadmaps

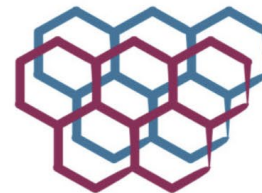
EBRC Roadmapping is an evergreen process, with new roadmaps available annually.



Engineering Biology
(2019)



Microbiome Engineering
(2020)



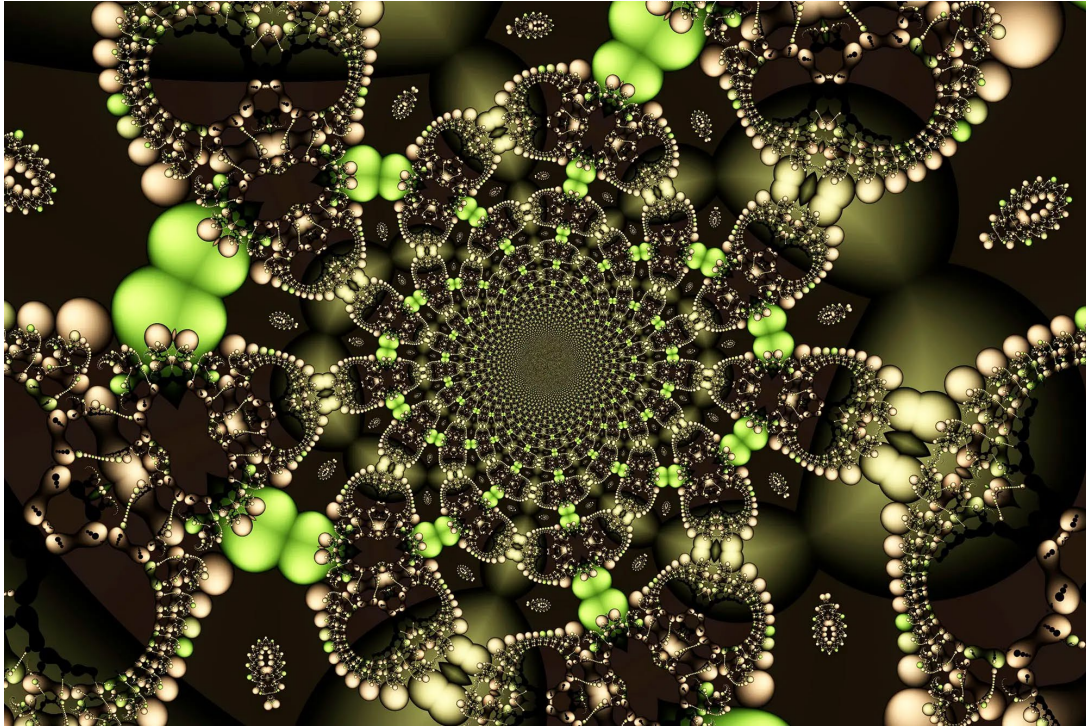
Engineering Biology & Materials Science
(2021)



Engineering Biology for Climate & Sustainability
(2022)

Moving Forward.....

Local RoL Activities, Coordination and Synergy



Potential Thrust Areas

- *Innovative (**synthetic biology**) tools and methods for health and environmental monitoring/diagnostics.*
- *“Road-mapping” for infrastructure and facility needs*
- *Training/strategy for collaborative culture and education related to RoL*
- *Networking & collaborations: (Bio-banks, CZ BioHubs, NIH Centers)*
- *Interdisciplinary education & workforce training*

Discussion

Q & A

Rules of Life - Research Community: *Plans & Ideas*

➤ Research tools, methods & infrastructure

❖ Core ideas

- *Diagnostics/Sensing: e.g., integrating biology with microelectronics/fab*
- *Imaging:*
 - *Nano-enabled : Molecules to Mice; Atoms to Animals*
 - *Cryo/Bio Microscopy & Characterization*
- *Infrastructure for SynBio Fab analogy – Road-mapping,*
- *RoL in unconventional fields and intersections:*
 - *Agriculture, food/water, enviro, extra-terrestrial/Space, AstroBio.*
- **Activities: Technical Themes/Seminars: Challenges in RoL Infrastructure/Facilities**

➤ Teaching/Training, Public/Societal Outreach/Impact:

- ❖ Museum/public Institutions, gardens and eco-parks
- ❖ Workforce development, community engagement/related