



Evolution of Nanomachines In Geospheres and Microbial Ancestors



Rutgers Annual ENIGMA Astrobiology Symposium

May 7-8, 2019

**Rutgers University, Cook Campus
Institute for Food, Nutrition, and Health - Room 101
61 Dudley Road, New Brunswick, NJ**

How did proteins evolve to become the predominant catalysts of life on Earth?

Tuesday, May 7th, from 8:30AM – 5:00PM

- 8:30-9:00 Coffee/tea and light breakfast
- 9:00-9:30 Welcome and Introductory Comments: Paul Falkowski
- Introductions from members present
- 9:30-9:45 Overview of Theme 1 - Synthesis and Function of Nanomachines in the Origin of Life:
Vik Nanda - plenary
- 9:45-10:00 Overview of Theme 2 - Increasing Complexity of Nanomachines in Microbial Ancestors:
Yana Bromberg – plenary
- 10:00-10:15 Overview of Theme 3 - Co-Evolution of Nanomachines and the Geosphere:
Nathan Yee – plenary
- 10:15-10:30 Break
- 10:30-12:00 Plenary Presentations: (6)
- Key questions: *Can small peptides catalyze reactions of importance to early biochemical evolution? What are the simplest structures that can perform a biological function? What are the oldest/most common structures found in proteins?*
 - 15 minute presentations by Bhanu Jagilinki, Josh Mancini, Guy Montelione, Andrew Mutter, Douglas Pike, Saroj Poudel
- 12:00-1:00 Lunch
- 1:00-2:50 Plenary Presentations (7)
- Key questions: *Which protein structures had evolved at the root of the evolutionary tree? Can we date important structural innovations that led to new metabolic functions? How did proteins and minerals co-evolve?*

- 15 minute presentations by Ian Campbell, Diego Ferreiro, Derek Gagnon, Adrienne Hoarfrost, Kenneth McGuinness , Vik Nanda on work of Hagai Ranaan
- 20 minute presentation by both Eli Moore and Stephanie Spielman

2:50-3:05 Break

3:05-4:30 [Discussion of Integration of Themes](#) - team leaders/participants

5:00 Leave for dinner at Pad Thai, 217 Raritan Avenue, Highland Park (<http://www.pad-thai.com/>, 732-247-9636)

Wednesday, May 8th, from 9:00 AM – 2:30PM

9:00-9:30 Coffee/tea and light breakfast

9:30-10:45 [Plenary Presentations: \(5\)](#)

- *Key questions: How can biological data and geologic data be integrated through evolutionary time? Can we identify and explore protein biosignatures in the geologic record?*
- 15 minute presentations by Kat Dawson, Mihaela Glamoclija, Juliane Gross Bob Hazen, Shaunna Morrison

10:45-11:00 Break

11:00-11:15 [Astrobiology Education](#): Nathan Yee

11:15-12:00 [Review and Discussion of Education and Outreach](#): Janice McDonnell - plenary

12:00-1:00 Working Lunch (with breakout for script writing in IFNH Boardroom)

1:00-2:30 [Final discussions](#): Review research priorities for Year 2

2:30 Adjourn

2:30-2:45 Break

2:45-4:30 [Reconvene for continuation of Script Writing Workgroup](#): with Janice McDonnell and Josh Kurz of Tilapia Film (for those interested in participating in education and outreach video productions)



The ENIGMA research team is part of the [NASA Astrobiology Institute \(NAI\)](#)