



2013 PROGRAM

- 8:00AM Registration & Continental Breakfast,**
Keeneland Room, W.T. Young Library
- 8:45AM Welcome - Dr. Eli Capilouto,**
President of the University of Kentucky
- 9:00AM Dr. Robert Hazen, George Mason University**
Genesis: The Scientific Quest for Life's Origins

Is life's origin a cosmic imperative manifest throughout the cosmos, or is life an improbable accident, restricted to a few planets (or only one)? Lacking observations of ecosystems beyond our own world, scientists seek experimental and theoretical frameworks to deduce the origin of life. In this context the concept of emergent systems provides a unifying approach. Natural systems with many interacting components, such as molecules, cells or organisms, often display complex behavior not associated with their individual components. The origin of life can be modeled as a sequence of emergent events – the synthesis of biomolecules, the selection and organization of those small molecules into functional macromolecules, the emergence of self-replicating molecular systems, and the initiation of molecular natural selection – which transformed the lifeless geochemical world of oceans, atmosphere and rocks into a living planet. This framework guides origin experiments, which can be designed to focus on each emergent step.

- 10:00AM Break (refreshments available)**
- 10:30AM Dr. Ramanarayanan Krishnamurthy,**
Scripps Research Institute
In Search of Alternatives to Understand the Emergence of RNA

Though the emergence of RNA is viewed as a critical step in the origins of life field, our understanding of how (and why) RNA emerged in Nature is equivocal and continues to engage, intrigue and fascinate the imagination. From a purely chemical point of view the questions, in this context, are:

- What is special about the components (ribose, phosphate and canonical nucleobases) - and the emergent properties - of RNA?

- Could RNA have emerged in the prebiotic era? The lecture will present our attempts towards an understanding gained by comparing the properties of RNA to its potentially (generationally simpler) natural alternatives. Such an approach not only discloses unconventional informational systems, novel chemical reactivity and reaction pathways, but - more importantly - provides an appreciation for the uniqueness of the structure and function of RNA in the context of chemical evolution.

- 11:30AM Lunch**
- 1:30PM Poster Session**
Gallery, W.T. Young Library
- 2:30PM Dr. Ada Yonath, Weizmann Institute of Science**
Origins of life: from prebiotic peptide bond formation to the contemporary ribosome

Ribosomes possess spectacular architecture accompanied by inherent mobility, allowing for their smooth performance as polymerases of amino acids. Peptide bonds are formed and elongated within a universal semi-symmetrical region connecting all of the remote ribosomal features involved in nascent chain creation and elongation. The elaborate architecture of this reaction positions ribosomal substrates in appropriate stereochemistry for peptide bond formation, substrate-mediated catalysis, substrate translocation and nascent chain insertion into their exit tunnel.

The high conservation of this region implies its existence irrespective of environmental conditions implying that it may represent an ancient RNA apparatus with bonding capabilities, which turned into peptide bond maker, thus capable of creating oligopeptides. Those oligopeptides that were found useful survived and triggered the formation of the genetic code, which was optimized simultaneously with the optimization of the bonding apparatus, namely the ribosome, as well as the genetic code, its molecular tools and its products: the mature proteins.

- 4:00PM Award Ceremony**

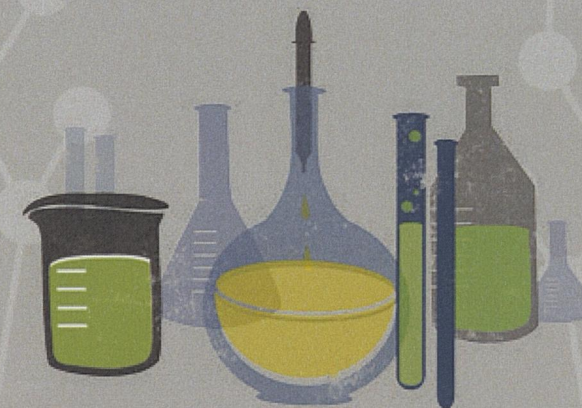
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39th Annual Symposium on

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Established by M. Benton Naff
in memory of Anna S. Naff

The Origin of Life

Friday, April 12, 2013

SPEAKERS

Dr. Robert Hazen,
Dr. Ramanarayanan Krishnamurthy
Dr. Ada Yonath

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ARTS & SCIENCES