

248th National ACS Meeting

Division of Physical Chemistry

Extreme Biochemistry from Small Molecules to Large Proteins: Formation, Stability, Structure and Function

Ralf Kaiser
Robert J. Stanley
Yong Ba
Organizers

Moscone Center West Building

Room 2003

August 10-13, 2014

Sunday Morning (36)

Origins of Life

Robert Stanley and Yong Ba, Presiding

8:45. Introductory Remarks

8:50 (48). Record of microbial evolution preserved in pure glacial ice, [P. Buford Price](#), Ajeeth Adhikari, Stephen Giovannoni, Kevin Vergin, Jeffrey Morris

9:30 (49). RNA world: Coming out of the shadows, [Antonio Lazcano](#)

10:10 INTERMISSION

10:40 (50). Synthetic biology and the search for extraterrestrial life, [Lynn J Rothschild](#), Kosuke Fujishima, Ivan Paulino-Lima

11:20 (51). Exogenous contribution of comets, asteroids, and meteorites for the origin of life, [Zita Martins](#)

Sunday Afternoon (31)

Astrochemistry

Ralf Kaiser and Robert Stanley, Presiding

1:30 (104). Mars organic analyzer: Methods and instrumentation for detecting trace organic molecules in our solar system, [Richard Mathies](#), Peter Willis, Robert Lillis, Ronald Amundson, Kuther Beegle, Anna Butterworth, David Curtis, Pascale Ehrenfreund, Frank A Grunthaler, Robert Hazen, Ralf Kaiser, Jungkyu Kim, Michael Ludham, Maria Mora, James Scherer, Amanda Stockton, Paul Turin, Kees Welten, Kenneth Williford

2:10 (105) Low energy electron induced chemistry in simple molecular solids, [Andrew D. Bass](#), Léon Sanche

2:50 (106). On the formation of biorelevant molecules in Kuiper Belts: From our solar system to extrasolar Kuiper Belts, [Ralf I Kaiser](#), Brant M Jones

3:10 INTERMISSION

3:40 (107). On the formation of quinoline and the role of gas phase reactions in the synthesis of prebiotic molecules, [Dorian S. N. Parker](#), Tao Yang, Ralf I. Kaiser, Tyler Troy, Musa Ahmed, Timothy J. Lee

4:20 (108). New chemical species produced by low energy electrons in simple molecular surface ices containing N₂O and C₂D₂: Chemical transformation of surface ices, [Nasrin Mirsaleh-Kohan](#), Sasan Esmaili, Andrew D Bass, Michael A Huels, Leon Sanche

4:40 (109). Multifrequency virtual spectrometer for astrochemistry applications, [Malgorzata Biczysko](#), Julien Bloino, Vincenzo Barone

Monday Morning (33)

Prebiotic Chemistry

Daniel Strongin and Robert Stanley, Presiding

8:30 (160). Shock-synthesis of prebiotic compounds in oxidizing and reduced impacting simple ices. [Nir Goldman](#)

9:10 (161). Phosphorus: Novel prebiotic reaction pathways unveiled from the geologic record. [Matthew A Pasek](#)

9:50 (218). Structural and energetic aspects of the replacement of phosphorus by arsenic in DNA and ATP: A quantum chemical view. [Yves Ellinger](#), Julien Pilmé, Nicolas Bolik-Coulon, Françoise Pauzat

10:15 INTERMISSION

10:35 (163). Ammonia formation from nitrite and nitrate on molybdenum-modified iron sulfide surfaces. [Daniel Strongin](#), Alex Gordon, Samantha Shumlas, Alex Smirnov, Elizabeth Cerkez, Martin A. Schoonen

11:15 (164). Polymerization of dihydroxyacetone catalyzed by mineral surfaces in simulated meteoric impact experiments. [Vanessa P. McCaffrey](#), Nicolle E.B. Zellner

11:40 (165). Construction and properties of prebiotic chemical reaction networks. [Dmitrij Rappoport](#), Dmitry Yu. Zubarev, Alán Aspuru-Guzik

Monday Afternoon (24)

Biomolecules Under Stress

Robert Stanley, Presiding

1:30 (217). Enhancing homochirality by enantio-selective adsorption: A statistical approach. [Francoise Pauzat](#), Gael Marloie, Alexis Markovits, Yves Ellinger

1:55 (162). Using water-air interfaces to build complexity in prebiotic systems. Elizabeth C. Griffith, Rebecca J. Rapf, [Veronica Vaida](#)

2:20 (2019). Radiolytic destruction of amino acids from Mars to the interstellar medium. [Reggie L Hudson](#), Perry A Gerakines

2:45 INTERMISSION

3:15 (220). Understanding UV hardiness in prebiotic nucleic acids. Marshall Ligare, Faady Siouri, [Mattanah de Vries](#)

3:40 (221). UV-induced charge separation in a DNA dinucleotide. [Yuyuan Zhang](#), Jordan Dood, Ashley Beckstead, Xi-Bo Li, Khiem V Nguyen, Cynthia J Burrows, Roberto Improta, Bern Kohler

4:05 (222). Unraveling the vacuum ultraviolet photochemical sinks of CO₂ molecules. [Zhou Lu](#), Yih Chung Chang, Yanice Benitez, C. Y. Ng, William M. Jackson

Tuesday Morning (31)
Extreme Enzymes
Robert Stanley and Yong Ba, Presiding

8:30 (273). Thermal collapse of the time required for primordial chemistry and the early evolution of enzymes. Richard Wolfenden
9:10 (274). Tapping new sources of cellulases: Extremophiles add to the fray. Douglas S Clark
9:50 (275). Mass spectrometry based approaches to probe bacterial and archaeal colonies and environments. Musahid Ahmed, Lynelle Takahashi, Yigang Fang
10:30 INTERMISSION
11:00 (276). Blurred line separating mesophilic and thermophilic enzymes. Engin H. Serpersu and Xiaomin Jing
11:40 (277). DNA repair under extreme conditions: The redox chemistry and thermodynamics of substrate binding of an extremophilic DNA photolyase. Yvonne M Gindt, Ban Edani, Sudipto Munshi, Robert Stanley

Wednesday Morning (29)
Extreme Enzymes
Robert Stanley, Presiding

8:50 (331). Extreme proteins: How fast-folding and stable can we make proteins? Martin Gruebele
9:15 (332). Combined bioinformatic and experimental approach to extreme enzyme function: The case of a cold and salt active β -galactosidase from Antarctica. Shiladitya DasSarma, Ram Karan, Jong-Myoung Kim, Kyle King, Priya DasSarma
9:55 (333). Novel enzymes and pathways in the Archaea. Haruyuki Atomi, Hiroya Tomita, Yuusuke Yokooji, Takuya Ishibashi, Tadayuki Imanaka
10:35 INTERMISSION
11:05 (334). Intermolecular interactions of type I ice binding proteins (IBP) with water in the ice-IBP-water interfaces and the molecular mechanism of action of IBPs to inhibit the growth of ice crystals. Yong Ba
11:45 (335). Extremophile DNA photolyases: DNA repair under extreme conditions. Sudipto Munshi, Yvonne M Gindt, Robert J Stanley

Wednesday Afternoon (23)
Extremophiles in Biotechnology
Robert Stanley and Yong Ba, Presiding

1:30 (385). Engineering a hyperthermophile to produce fuels and chemicals. Michael W Adams
2:10 (386). Mn(II)-dependent mechanisms of extreme oxidative stress resistance in bacteria and yeasts: The Humpty Dumpty paradigm. Michael J Daly
2:50 INTERMISSION
3:20 (387). Enzymology and biotechnology of acetate utilizing methanogens. James G Ferry
4:00 (388). Protein cage nanoreactors: Synthetic enzyme cascades derived from the hyperthermophile *Pyrococcus furiosus*. Trevor Douglas, Dustin P Patterson, Benjamin Schwarz

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