



**DCO WORKSHOP ON EXTREME BIOPHYSICS:
Molecular Adaptation to Life at the Extremes**

Saturday and Sunday, 14-15 November 2015

Arrival Friday Afternoon/Evening, 13 November

Conclusion 4:00 pm Sunday, 15 November

Carnegie Institution of Washington, Geophysical Laboratory
Greenewalt Building, 5251 Broad Branch Road NW, Washington, DC, 20015 USA

Workshop Organizing Committee:

Catherine Royer, Rensselaer Polytechnic Institute

Douglas Bartlett, Scripps Institution of Oceanography

Roland Winter, University of Dortmund

Toshiko Ichiye, Georgetown University

DRAFT PROGRAM

Friday, 13 November

Afternoon – Evening **Arrival and Hotel Check-In** *Hilton Garden Inn, Bethesda MD*
Hotel check-in is 3:00 pm, but early check-in can be arranged upon request

Saturday, 14 November

7:45 am **Shuttle pickup** *In front of Hilton Garden Inn, Bethesda MD*

8:00 – 8:30 am **Arrival at Geophysical Lab** *Greenewalt Building*

8:30 – 8:45 am **Workshop Organizing Committee**
Welcome notes

Russell Hemley, Carnegie Institution of Washington
Introduction to the DCO

8:45 – 9:15 am **Roland Winter**, University of Dortmund
Extreme biophysics – Current perspectives and potential synergies at the interface of DCO Science Communities

Morning Session: Presentations on Microbes and Molecules under Extremes

9:15 – 9:45 am **Douglas Bartlett**, Scripps Institution of Oceanography
Overview on adaptation mechanisms of extremophiles

9:45 – 10:15 am **Abram Aertsen**, Katholieke Universiteit Leuven
Synthetic reconstruction of extreme hydrostatic pressure resistance in bacteria

10:15 – 10:45 am **Break**

10:45 – 11:15 am **Isabelle Daniel**, Université Claude Bernard Lyon 1
Effect of pressure on microorganisms: An experimental approach

11:15 – 11:45 am **Angel Garcia**, Los Alamos National Laboratory
Pressure effects on the folding/unfolding stability of small proteins and RNA molecules

11:45 – 12:15 pm **Julien Roche**, National Institutes of Health
Protein folding and dynamics in high-pressure conditions

12:15 – 1:45 pm **Lunch**

Afternoon Session: Presentations on Experimental & Theoretical Tools in Extreme Biophysics

1:45 – 2:15 pm **Sol Gruner**, Cornell University
The missing link: High pressure crystallography

2:15– 2:45 pm **Joshua Wand**, University of Pennsylvania
Dancing under pressure: Protein dynamics, entropy, and other stories

2:45 – 3:15 pm **Toshiko Ichiye**, Georgetown University
Molecular dynamics simulations and other computational methods for extreme biophysics

3:15 – 3:45 pm **Break**

3:45 – 4:15 pm **Catherine Royer**, Rensselaer Polytechnic Institute
New instrumentation for quantitative biophysics in live cells under pressure

4:15 – 5:00 pm **Discussion**
Integrating biophysics into the DLC – breaking the ice

5:00 – 6:30 pm **Poster presentations**

6:30 – 8:30 pm **Dinner reception** *Tuve Dining Hall, Greenewalt Building*

8:30 pm **First shuttle pickup**

8:45 pm **Second shuttle pickup**

8:45 – 9:00 pm **Arrive back at hotel** *Hilton Garden Inn, Bethesda MD*

Sunday, 15 November

Morning **Hotel checkout for Sunday travelers** *Hilton Garden Inn, Bethesda MD*
A place to store your luggage during the day will be provided

7:45 am **Shuttle pickup** *In front of Hilton Garden Inn, Bethesda MD*

8:00 – 8:30 am **Arrival at Geophysical Lab** *Greenewalt Building*

Morning Session: Presentations about Deep Life and Extreme Physics and Chemistry

8:30 – 9:00 am **Everett Shock**, Arizona State University
Including biochemical processes in geochemical models at high pressure and temperature

9:00 – 9:30 am **Roberto Bini**, Università di Firenze
Reactivity and dynamics of small model molecules: A preliminary step to understand the pressure behavior of complex systems

9:30 – 10:00 am **Karyn Rogers**, Rensselaer Polytechnic Institute
New Tools for Sampling, Transport and Enrichment of Piezophiles

10:00 – 10:30 am **Break**

10:30 – 11:00 am **Michael Wilkins**, The Ohio State University
Survival mechanisms of an opportunistic colonizing microorganism in hydraulically fractured deep shale environments

11:00 – 11:30 am **Dionysis Foustoukos**, Carnegie Institution of Washington
Nitrogen cycling at deep-sea vents: Cultures at seafloor pressures and temperatures

11:30 – 12:00 pm **Rachael Hazael**, University College London
Applications of static and dynamic GPa pressures to biological systems and the implications for biophysics

12:00 – 1:30 pm **Lunch**

1:30 – 2:30 pm **Breakout Session 1** Moderated by Douglas Bartlett and Karyn Rogers
High pressure biophysics in vivo – brainstorming

Breakout Session 2 Moderated by Toshiko Ichiye and Tigran Chalikian
Molecular and microbial targets from extremophiles

2:30 – 3:00 pm **Break**

3:00 – 4:00 pm **Plenary discussion of breakout topics**
Topics of mutual interest, framework for fostering future scientific synergies

4:00 pm **Sunday travelers depart**
Taxis to Reagan or Dulles airport will be arranged for participants departing on Sunday evening

4:15 pm **Shuttle pickup**
For those staying at the hotel Sunday evening

4:30 pm **Arrive back at hotel** *Hilton Garden Inn, Bethesda MD*

4:00 – 5:00 pm **Organizing committee gathers to write meeting report and draft White Paper**

Monday, 16 October

Morning or Afternoon **Monday travelers depart**
Hotel checkout is 12:00 pm

Participant List

Abram Aertsen	Katholieke Universiteit Leuven
Ali Akbari	McGill University
Douglas Bartlett	Scripps Institution of Oceanography
Roberto Bini	Università di Firenze
Anais Bourges	Rensselaer Polytechnic Institute
Grayson Boyer	Arizona State University
Alfredo Caro	University of Pennsylvania
Tigran Chalikian	University of Toronto
Isabelle Daniel	Université Claude Bernard Lyon 1
Lorna Dougan	University of Leeds
Dionysis Foustoukos	Carnegie Institution of Washington
Peter Fox	Rensselaer Polytechnic Institute
Angel Garcia	Los Alamos National Laboratory
Bertrand Garcia-Moreno E.	Johns Hopkins University
Donato Giovanelli	Rutgers University
Sol Gruner	Cornell University
Rachael Hazael	University College London
Robert Hazen	Carnegie Institution of Washington
Russell Hemley	Carnegie Institution of Washington
Qi Huang	Georgetown University
Toshiko Ichiye	Georgetown University
Stefan Kast	University of Dortmund
Dennis Klug	NRC of Canada
George Makhatadze	Rensselaer Polytechnic Institute
Paul McMillan	University College London
Philippe Oger	École Normale Supérieure de Lyon
Emanuele Paci	University of Leeds
Ileana Perez-Rodriguez	University of Southern California
Aude Picard	Harvard University
Frank Robb	University of Maryland
Julien Roche	National Institutes of Health
Jocelyn Rodgers	Carnegie Institution of Washington/Georgetown University
Karyn Rogers	Rensselaer Polytechnic Institute
Catherine Royer	Rensselaer Polytechnic Institute
Craig Schiffries	Carnegie Institution of Washington
Anurag Sharma	Suffolk University
Everett Shock	Arizona State University
Mitchell Sogin	Marine Biological Laboratory
Dario Spigolon	University of Maryland
Dave Thirumalai	University of Maryland
Oscar Torres	Katholieke Universiteit Leuven
Kelly Tran	Georgetown University
Joshua Wand	University of Pennsylvania
Michael Wilkins	The Ohio State University
Roland Winter	University of Dortmund

Posters

Presented By

Poster Title

1. Anais Bourges
High pressure induced DNA damage in *Escherichia coli* involves pressure-mediated dissociation of the tetrameric Mrr restriction endonuclease
2. Grayson Boyer
Thermodynamic Constraints on the Biosynthesis and Diagenesis of Bacteriohopanepolyol Lipid Biomarkers in Active Hydrothermal Systems and the Geologic Record
3. Alfredo Caro
Role of conformational entropy in extremely high affinity protein interactions
4. Alfredo Caro
Internal cavities and their role as determinants of pressure unfolding of proteins
5. Tigran Chalikian
Volumetric insights into protein-cosolvent interactions
6. Qi Huang
Jocelyn Rodgers
Kelly Tran
Toshiko Ichiye
Studying High Pressure Effects on Proteins using Molecular Dynamics Simulations
7. Stefan Kast
Electronic structure at high hydrostatic pressure
8. Philippe Oger
Coping with the pressure: Microbial adaptation to high hydrostatic pressure in deep hydrothermal vent piezophiles
9. Ileana Perez-Rodriguez
Metabolic ecology of chemosynthetic nitrate reducing ϵ -*Proteobacteria* and *Aquificae* from deep-sea vents
10. Aude Picard
Evolution of organo-mineral structures formed by Fe(II)-oxidizing bacteria during experimental diagenesis
11. Frank Robb
Characterization of the An Archaeal-like Chaperonin From a Thermophilic, Uncultured Deep Subsurface Bacterium: The First Characterized Protein from *Candidatus Desulforudis audaxviator* MP104C.

Contact Information

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