

The Gibbs Conference on Biothermodynamics

History

Fall, 1986

Discussion of the discipline: Thermodynamics in Biological Systems.

The Gill residence in Vail, Colorado.

Gary Ackers, Wayne Bolen, Ernesto Freire, Stan Gill, Jim Lee.

February, 1987

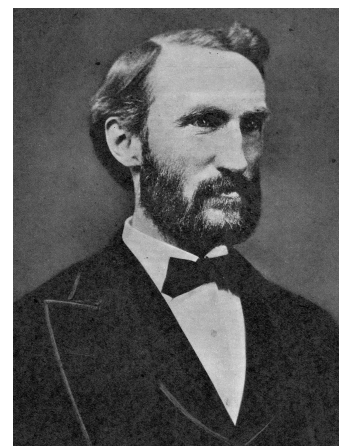
Discussion of the discipline: Thermodynamics in Biological Systems.

The Gumbo Shop, New Orleans, LA during the 31st Annual

Biophysical Society Meeting.

Gary Ackers, Norma Allewell, Wayne Bolen, Ken Breslauer, Ken Dill,

Ernesto Freire, Stan Gill, Jim Lee.



**Professor
Josiah Willard Gibbs**

A history of the first ten years of the meeting was provided by Ackers GK and Bolen DW in the article entitled "The Gibbs Conference on Biothermodynamics: Origins and Evolution" published in Biophysical Chemistry 64 (1997) 3-5 (doi:10.1016/S0301-4622(96)02246-6).

An update is provided by Shea, MA, Correia, JJ, and Brenowitz, MD, entitled "Introduction: Twenty five years of the Gibbs Conference on Biothermodynamics" available in Biophysical Chemistry 159 (2011) 1-5 (doi:10.1016/j.bpc.2011.07.002).

Meetings

All meetings have been held at the Touch of Nature Environmental Center associated with Southern Illinois University–Carbondale. From 1987 through 1993, all of the speakers in the scientific sessions were students or postdoctoral fellows.

<u>Year</u>	<u>Conference Organizers</u>	<u>Keynote Speakers</u>
1987	Jim Lee and Wayne Bolen	<i>Philosophical Talks</i> by Gary K. Ackers and Ken Dill
1988	Gary Ackers and Michael Johnson	
1989	Susan G. Frasier and Michael Johnson	
1990	Michael Johnson and Marty Straume	
1991	Gary Ackers and Tim Lohman	Ernesto Freire
1992	Jim Lee and Tomasz Heyduk	Serge Timasheff and John Schellman
1993	Maurice Eftink and Glen Ramsay	Peter von Hippel and Julian Sturtevant
1994	Enrico Di Cera and Madeline Shea	Gary K. Ackers and Kathleen S. Matthews
1995	Kenneth P. Murphy and Michael D. Brenowitz	Victor Bloomfield and Mario Amzel
1996	Jonathan B. Chaires and Michael L. Doyle	J. Michael Schurr and Allen Minton
1997	Dorothy Beckett and Jack Correia	Adrian Parsegian
1998	Andy Robertson	David Draper
1999	Bertrand Garcia-Moreno E. and John Shriver	Wayne Bolen and Gary Ackers
2000	George Turner and Kim Sharp	Steve White
2001	Margaret A. Daugherty and Luis A. Marky	George Rose
2002	Michael Mossing and George Makhatadze	Rodney Biltonen
2003	Vince Hilser and Dick Sheardy	Jim Lee

<u>Year</u>	<u>Conference Organizers</u>	<u>Keynote Speakers</u>
2004	Doug Barrick and Kathleen Hall	Nacho Tinoco
2005	Trevor Creamer and Clay Clark	Carl Frieden
2006	Karen Fleming and Rohit V. Pappu	Madeline A. Shea and Timothy Lohman
2007	Brian M. Baker and Michael T. Henzl	Jamie Williamson
2008	Jannette Carey and David Bain	Dorothy Beckett and Ken Dill
2009	Nathan Baker and Liskin Swint-Kruse	Linda Jen-Jacobson
2010	Elisar Barbar and Vince LiCata	C. Nick Pace
2011	Gibbs Society Board of Directors Editors of Special Issue of <i>Biophysical Chemistry</i> Enrico Di Cera, Tim Lohman, Jack Correia	Bertrand Garcia-Moreno E.
2012	Aaron L. Lucius and Patricia L. Clark	Terry G. Oas
2013	James L. Cole and Aron W. Fenton	Doug Barrick
2014	Andrew B. Herr and Steven T. Whitten	Karen G. Fleming
2015	Ernesto J. Fuentes and James R. Horn	Rohit V. Pappu
2016	Sarah Bondos and Nick Fitzkee	Patricia Clark
2017	Scott Showalter and Ana-Maria Soto	Enrique de la Cruz
2018	Chiwook Park and David Draper	Kevin Plaxco
2019	Matthew Auton and Carlos Castañeda	Cathy Royer

The Annual Gary K. Ackers Lectures in Biothermodynamics

Since 2009, the Gibbs Society Board of Directors sponsors an annual lecture honoring the scientific contributions of Gary K. Ackers (1939-2011) to the field of Biological Thermodynamics.

<u>Year</u>	<u>Conference Organizers</u>	<u>Ackers Lecturer</u>
2009	Nathan Baker and Liskin Swint-Kruse	Michael Brenowitz
2010	Elisar Barbar and Vince LiCata	Timothy Lohman
2011	Gibbs Society Board of Directors	Madeline Shea
2012	Aaron L. Lucius and Patricia L. Clark	Enrico Di Cera
2013	James L. Cole and Aron W. Fenton	Bertrand Garcia-Moreno E.
2014	Andrew B. Herr and Steven T. Whitten	David E. Draper
2015	Ernesto J. Fuentes and James R. Horn	Walter S. Englander
2016	Sarah Bondos and Nick Fitzkee	Ken Dill
2017	Scott Showalter and Ana-Maria Soto	Dorothy Beckett
2018	Chiwook Park and David Draper	Jim Lee
2019	Matthew Auton and Carlos Castañeda	John "Jack" Correia

Gibbs Society Governance

Incorporation

In 2002, the Gibbs Society of Biological Thermodynamics incorporated in the Commonwealth of Virginia, under the guidance of Michael L. Johnson, then Treasurer of the Society. Articles of Incorporation and By-laws are available here: <http://www.jhu.edu/~gibbs>

Current Officers

President: Brian Baker, 2018 – 2019
Vice President: Michael L. Johnson, 2010 – 2020
President Elect: Kathleen Hall, 2018-2019
Secretary: Liskin Swint-Kruse, 2013 – 2019
Treasurer: Aron Fenton, 2017 – 2020

Board of Directors, listed alphabetically

Brian Baker
Clay Clark
Aron Fenton
Kathleen Hall
Vince LiCata
Madeline Shea
Liskin Swint-Kruse

Past Presidents

2001-2002	Gary K. Ackers	2010-2011	Karen G. Fleming
2002-2003	J. Jack Correia	2011-2012	Doug Barrick
2003-2004	D. Wayne Bolen	2012-2013	David L. Bain
2004-2005	Madeline A. Shea	2013-2014	George I. Makhatadze
2005-2006	Dorothy Beckett	2014-2015	Patricia Clark
2006-2007	J. Brad Chaires	2015-2016	Vince LiCata
2007-2008	Tim M. Lohman	2016-2017	James Cole
2008-2009	Luis A. Marky	2017-2018	Clay Clark
2009-2010	Bertrand Garcia-Moreno E		

Past Treasurer

2001-2011 Michael L. Johnson

Past Secretary

2004-2013 Margaret A. Daugherty

Committees and Other Contributions

Ackers Lecturer Selection Committee – Madeline A. Shea, Chair
Gibbs Society Website Hosting – Karen G. Fleming (2010 – present)
Registration and PayPal – Nick Fitzkee
Mailing List – Liskin Swint-Kruse
Saturday Night Thermo Organizers – Susan Pedigo and Vincent J. LiCata
With thanks to Brummer at the Touch of Nature Conference Center

Confidentiality Statement

Please remember that the abstracts for this meeting are confidential material and may contain unpublished results. They will not be posted online. Please ask permission from the authors before taking photos of posters. Please do not record the talks unless a speaker has given you permission.

Code of Conduct

The Gibbs Society of Biological Thermodynamics is committed to providing a safe and productive environment that fosters open dialogue and the exchange of scientific ideas, promotes equal opportunities and treatment for all participants, and is free of harassment and discrimination. Harassment includes speech or behavior that is not welcome or is personally offensive, whether it is based on ethnicity, gender, religion, political opinion, age, body size, disability, veteran status, marital status, sexual orientation, gender identity, or any other reason. It includes stalking, unnecessary touching, and unwelcome attention. Behavior that is acceptable to one person may not be acceptable to another, so use discretion to be sure that respect is communicated. Harassment intended in a joking manner still constitutes unacceptable behavior. Anyone experiencing conduct that violates this code should report this conduct to any member of the Gibbs Society Board.



11th Annual Gary K. Ackers Lecture in Biothermodynamics

2019 Lecturer - John “Jack” Correia, University of Mississippi Medical Center

This lecture honors the scientific contributions of Gary K. Ackers (1939-2011) to the field of Biological Thermodynamics. He served on the faculty at the University of Virginia, Johns Hopkins University and the Washington University School of Medicine. He was a Fellow of the Biophysical Society and was one of the founding organizers of the Gibbs Conference.

Gary demonstrated a lifelong commitment to the growth and development of an intellectual community of scholars devoted to furthering the field of biothermodynamics. Gary was an active member of the Biophysical Society throughout his career and served as President of the Society, as well as Organizer of the annual meeting. While on the faculty of the University of Virginia, he was a leader in the graduate biophysics training program. When on the faculty in the Department of Biology at the Johns Hopkins University, he conceived and organized the Institute for Biophysical Studies of Macromolecular Assemblies, a university-wide training program in molecular biophysics that has continued for decades. While at Johns Hopkins, he also played a leading role in the establishment of the Gibbs Conference on Biothermodynamics, an annual meeting organized to promote innovative development of biophysical principles applied to current problems in biology and to train the next generation of molecular biophysicists to tackle hard problems rigorously. After moving to St. Louis to chair the Department of Biochemistry and Molecular Biophysics at Washington University, he spearheaded a new graduate program in biophysics and hired many faculty who have joined the community of regular contributors to the Gibbs Conference.

Gary was a pioneer in the development of methods and application of principles of equilibrium thermodynamics to the study of linkage in complex macromolecular assemblies. Studies from his laboratory on the energetics of self-association and ligand binding in human hemoglobin proved unequivocally that the classic and elegant MWC model of intersubunit allostery was insufficient to explain cooperative oxygen binding: the position, as well as the number, of ligands matters. His contributions in this area greatly enhanced our understanding of the relationship between structure, energy and function in hemoglobin, and in multimeric allosteric systems in general. By probing ever more deeply into the molecular mechanism of cooperativity, he demonstrated a beautiful, useful, and general strategy for dissecting functional energetics in macromolecular assemblies.

His quantitative study of the interactions between proteins and nucleic acids in the bacteriophage lambda system included the development of quantitative DNase footprinting methods for measuring free energies of repressor-operator interactions. The footprinting assay remains an effective tool for measuring the extremely tight binding constants that are often encountered in site-specific interactions between proteins and nucleic acids. Those studies paved the way for similar methods to study protein-nucleic acid interactions in more complex systems, including time-resolved studies of the kinetics of RNA folding. Based on his experimental studies of phage lambda, his group developed statistical thermodynamic models to simulate the lysogenic-to-lytic growth switch: the series of macromolecular events that determine the fate of bacteriophage lambda during infection of *E. coli*. This work demonstrated how a complex biological function could be predicted quantitatively, strictly from the kinetics of transcription and translation, and the Gibbs free energy of interactions between the key macromolecular components in the genetic switch.

During Gary's early career, he developed methods to measure association constants in self-associating systems based on analytical gel permeation chromatography. Those methods have since become standard tools in the field. His group was also responsible for modifications of the cryo-gel electrophoresis methods, moving from applying them to hemoglobin to protein-DNA interactions. These contributions focused on developing the capacity to quantify intermediate states that are only transiently populated during the course of a biochemical process. His more than 200 articles and chapters changed our view of the molecular mechanisms that govern complex biochemical reactions.



Saturday Evening ▲ October 5, 2019

4:00 – 10:00 pm **Check-in at Little Grassy Lodge**

7:30 – 10:00 pm **Opening Reception in Freeberg Hall**

Light refreshments, beer, wine, and soft drinks. Participants are expected to make dinner arrangements independently.

Gibbs T-shirts and Mugs – Pick up at registration

Saturday Night Thermo – Event for trainees only

Faculty Organizers: Vince LiCata, Louisiana State University
Susan Pedigo, University of Mississippi

Trainee Moderators: James Hutchison, Sanders Lab, Vanderbilt University
Mayank Boob, Gruebele Lab, University of Illinois at Urbana-Champaign

5:30 – 6:00 pm **Dinner for trainees who registered in advance (River Radio Retreat)**

6:00 – 7:00 pm **Flash Talks – Session open to all trainees (Little Grassy Lodge).**

- 1. Conformational bias in denatured proteins and its role in folding**
Ari Paiz, Whitten Lab, Texas State University
- 2. Protein-complex stability in living cells**
Shannon Speer, Pielak Lab, University of North Carolina at Chapel Hill
- 3. Energetics of dimeric FkpA binding to a native unfolded membrane protein client**
Michaela Roskopf, Fleming Lab, Johns Hopkins University
- 4. Cracking-open the mystery of Fluc dimerization**
Melanie Ernst, Robertson Lab, Washington University in St. Louis
- 5. Evolution of specificity and stability in the folding trajectory of caspase**
Suman Shrestha, Clark Lab, University of Texas at Arlington
- 6. RNA motif rearrangement prediction using restraint guided REMD**
Simi Kaur, Chen Lab, University at Albany
- 7. Thermodynamic stability of a cold-active DNA polymerase I from *Psychromonas ingrahamii***
Xinji Zhu, LiCata Lab, Louisiana State University
- 8. Effects and mechanisms of discriminator changes on open complex formation, stabilization, and transcription initiation**
Hao-Che Wang, Record Lab, University of Wisconsin Madison

7:00 – 7:15 pm **Refreshment Break**

7:15 – 7:45 pm **Career Panel** – Session open to all trainees.
Emanuel Lissek, Lumicks, Cambridge, MA
Ivana Simonovic, GE Lifesciences, Chicago, IL

7:45 – 8:15 pm **Service and Outreach Discussion on Teaching in Prisons**
Jannette Carey, Princeton University

8:15 pm **Adjourn to Reception in Freeberg Hall**

Sunday Morning ▲ October 6, 2019

7:00 – 8:20 am	Breakfast in Freeberg Hall
8:30 – 8:35 am	President's Welcome by Brian Baker, University of Notre Dame
8:35 – 8:40 am	Organizers' Comments

33rd Annual Gibbs Conference Keynote Lecture

<i>Moderator</i>	Catie Knoverek, Bowman Lab, Washington University in St. Louis
8:40 – 8:50 am	Introduction to the 33rd Annual Gibbs Conference Keynote Speaker Dorothy Beckett, University of Maryland – College Park
8:50 – 9:40 am	Keynote Lecture Biology under pressure: The “other” thermodynamic variable Catherine Royer, Rensselaer Polytechnic Institute
9:40 – 9:50 am	Keynote Q&A
9:50 – 10:20 am	Break – Refreshments in River Radio Retreat

Session I: Allostery and Coupling

<i>Moderator</i>	Catie Knoverek, Bowman Lab, Washington University in St. Louis
10:20 – 10:50 pm	Evaluating “silent coupling” in rabbit M₁ pyruvate kinase Aron Fenton, University of Kansas Medical Center
10:50 – 11:10 am	Are the intrinsically disordered linkers involved in SSB binding to accessory proteins? Min Kyung Shinn, Lohman Lab, Washington University in St. Louis
11:10 – 11:40 am	Nature utilizes dynamic allostery for evolution S. Banu Ozkan, Arizona State University
11:40 – 12:00 pm	Towards a biophysical characterization of the translational isoforms of the human glucocorticoid receptor Emily Grasso, Hilser Lab, Johns Hopkins University
12:00 – 12:05 pm	General Discussion
12:10 pm	Conference Photo near Freeberg Hall
12:30 pm	Lunch in Freeberg Hall
1:00 – 2:45 pm	Canoeing – Freeberg Patio to walk to the lake Those interested should contact Tom Brummer at the front desk. (Limited to 40 participants)

Free Time until Afternoon Session

Information about local parks and attractions is available near the entrance to Little Grassy Lodge.

Sunday Afternoon ▲ October 6, 2019

Session II: Folding and Stability

<i>Moderator</i>	Ryan Mahling, Madeline Shea Lab, University of Iowa
3:00 – 3:30 pm	Protein folding: A different perspective George Rose, Johns Hopkins University
3:30 – 3:50 pm	Improving Upside simulations for protein folding and HX studies Xiangda Peng, Sosnick Lab, University of Chicago
3:50 – 4:10 pm	Stability, coupling, and the partly-folded states of topoisomerase V Mark Petersen, Barrick Lab, Johns Hopkins University
4:10 – 4:40 pm	Break – Refreshments in River Radio Retreat
4:40 – 5:10 pm	Imaging protein thermodynamic stability and folding kinetics in hydrogels Lydia Kisley, Case Western Reserve University
5:10 – 5:30 pm	Single-molecule fluorescence spectroscopy of apolipoprotein E Melissa Stuchell-Brereton, Sorzano Lab, Washington University in St. Louis
5:30 – 5:50 pm	Destabilizing the CLC-ec1 homodimer in lipid bilayers with multiple substitutions to alanine Kacey Mersch, Robertson Lab, University of Iowa & Washington University in St. Louis
5:50 – 6:20 pm	Effect of sequence on the conformation and stability of RNA riboswitches Ana Maria Soto, Towson University
6:20 – 6:25 pm	General Discussion
6:30 pm	Dinner in Freeberg Hall

Sunday Evening ▲ October 6, 2019

8:00 – 10:00 pm	Poster Session I in Burke Hall (lower level) Presenters with last name A to Ma; please remove posters before midnight to make room for Monday presenters Sponsors' Displays in Freeberg Hall (upper level) – near beer, wine, and soft drinks
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Monday Morning ▲ October 7, 2019

7:00 – 8:20 am	Breakfast in Freeberg Hall
8:30 – 8:40 am	Announcements

11th Annual Gary K. Ackers Lecture

<i>Moderator</i>	Alex Guseman, Gronenborn Lab, University of Pittsburgh
8:40 – 8:50 am	Introduction to the Gary K. Ackers Lecture in Biothermodynamics Jonathan “Brad” Chaires, University of Louisville
8:50 – 9:40 am	Ackers Lecture High concentration biophysics is nonideal: How we got here, where we are going! Jack Correia, University of Mississippi Medical Center
9:40 – 9:50 am	Keynote Q&A
9:50 – 10:20 am	Break – Refreshments in River Radio Retreat

Session III: Phase Transitions

<i>Moderator</i>	Alex Guseman, Gronenborn Lab, University of Pittsburgh
10:20 – 10:50 pm	Fibrillization and liquid-liquid phase separation of the tau protein Joan Shea, University of California Santa Barbara
10:50 – 11:10 am	Effects of multivalency on the Pdx1-SPOP binding interaction Grace Usher, Showalter Lab, Pennsylvania State University
11:10 – 11:30 am	Critical phenomena in the temperature-pressure crowding phase diagram of a protein Mayank Boob, Gruebele Lab, University of Illinois at Urbana-Champaign
11:30 – 12:00 pm	TRF2-DNA complexes: From single DNA chain compaction to phase separation Roberto Galletto, Washington University in St. Louis
12:00 – 12:05 pm	General Discussion
12:10 – 12:25 pm	Vendor Introduction
12:30 pm	Lunch in Freeberg Hall
1:00 – 2:45 pm	Interpretive Nature Hike – Freeberg Patio to start hike The Environmental Education staff will take up to 25 participants for this hike on a trail along the shore of Little Grassy Lake. Please contact Tom Brummer at the front desk to register.
1:30 – 2:30 pm	Business Meeting of Past and Current Organizers – River Radio Retreat Refreshment area will be unavailable to other meeting attendees during this time.

Free Time until Afternoon Session

Information about local parks and attractions is available near the entrance to Little Grassy Lodge.

Monday Afternoon ▲ October 7, 2019

Posters to be presented on Monday night may be mounted as soon as space is available on Sunday night. The Airport Ride Board will be available in Little Grassy Lodge, near the check-in window.

Session IV: Dynamics and Function

<i>Moderator</i>	Jason Devlin, Baker Lab, University of Notre Dame
3:00 – 3:30 pm	Uncovering unusual tyrosinate fluorescence during investigation of conserved tryptophan in immunoglobulin domain Moriah Beck, Wichita State University
3:30 – 3:50 pm	Involvement of rapid conformational dynamics in molecular recognition captured via residue-specific infrared spectroscopy Gregory Bukowski, Thielges Lab, Indiana University Bloomington
3:50 – 4:10 pm	Downstream sequence-dependent RNA cleavage and pausing by RNA polymerase I Catherine Scull, Lucius Lab, University of Alabama at Birmingham
4:10 – 4:40 pm	Break – Refreshments in River Radio Retreat
4:40 – 5:10 pm	Driving forces underlying the biogenesis of outer membrane proteins Karen Fleming, Johns Hopkins University
5:10 – 5:30 pm	Practical approach to extract thermodynamic and kinetic information from intermolecular NMR relaxation experiments Yusuke Okuno, Clore Lab, National Institutes of Health
5:30 – 6:00 pm	Disorder as a driver of biological filtration Loren Hough, University of Colorado, Boulder
6:00 – 6:05 pm	General Discussion
6:10 pm	Dinner in Freeberg Hall

Monday Evening ▲ October 7, 2019

8:00 – 10:00 pm	Poster Session II in Burke Hall (lower level) Presenters with last name Me to Z Sponsor's Displays in Freeberg Hall (upper level) – Near the beer, wine, and soft drinks.
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Tuesday Morning ▲ October 8, 2019

7:00 – 8:30 am **Breakfast in Freeberg Hall**
8:40 – 8:45 am **Announcements**

Session V: Macromolecular Assemblies and Complexes

Moderator Emma Schoch, Kovall Lab, University of Cincinnati

8:45 – 9:05 pm **Towards next-generation predictions for the proteostatic effects of mutations within integral membrane proteins**
Charles Kuntz, Schlebach Lab, Indiana University Bloomington

9:05 – 9:25 am **Investigating competitive protein adsorption to a nanoparticle surface**
Rebecca Hill, Fitzkee Lab, Mississippi State University

9:25 – 9:55 am **Molecular driving forces and kinetics in hairpin polyamide-DNA interactions**
Cynthia Dupureur, University of Missouri – St. Louis

9:55 – 10:25 am **Break – Refreshments in River Radio Retreat**

10:25 – 10:45 am **Probing the conformational landscape of inter-domain interactions by simulated tempering**
Kenneth Huang, Poon Lab, Georgia State University

10:45 – 11:05 am **DNA bending/unbending rates revealed for nonspecific architectural DNA-binding protein *yNhp6A***
Viktoriya Zvoda, Ansari Lab, University of Illinois at Chicago

11:05 – 11:35 am **Robustness and kinetic trapping in proteasome assembly**
Eric Deeds, University of California, Los Angeles

11:35 – 11:45 am **Closing Remarks by Organizers and President**

12:00 pm **Box Lunch in Freeberg Hall and Check-out**

Please leave your keys at the counter in Little Grassy Lodge.