

# DAN HERSCHLAG

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## EDUCATION

1989-1992 Postdoctoral Scholar, University of Colorado; Advisor: Dr. T.R. Cech  
1983-1988 Ph.D., Biochemistry, Brandeis University; Advisor: Dr. W.P. Jencks  
1982-1983 University of Minnesota; Research with Dr. J.E. Gander  
1979-1982 B.S., Biochemistry, SUNY-Binghamton; Research with Dr. E.S. Stevens  
1976-1978 University of Michigan

## RESEARCH & PROFESSIONAL EXPERIENCE

2002-present Professor of Biochemistry, Stanford University School of Medicine;  
Professor of Chemical Engineering, by Courtesy  
2012-present ChEM-H Faculty Fellow, Stanford University  
2012-2016 Stanford Institute of Chemical Biology, Executive Committee  
2011-2015 Senior Associate Dean of Graduate Education and Postdoctoral Affairs, Stanford University  
School of Medicine  
2002-2019 Professor of Chemistry, by Courtesy  
2001-2002 Associate Professor of Biochemistry, Stanford University School of Medicine;  
Associate Professor of Chemical Engineering and of Chemistry, by Courtesy  
1997-2000 Associate Professor of Biochemistry, Stanford University School of Medicine;  
Associate Professor of Chemistry, by Courtesy  
1992-1997 Assistant Professor of Biochemistry, Stanford University School of Medicine;  
Assistant Professor of Chemistry, by Courtesy

## HONORS & AWARDS

2020 Founders Award, Biophysical Society  
2019 Excellence in Mentoring and Service Award, Stanford University Biosciences  
2018 National Academy of Sciences Member  
2016 Outstanding Ally Award, Stanford University Postdoctoral Association (SURPAS)  
2012 Faculty Award for Student Services, Stanford University School of Medicine  
2010 ASBMB William Rose Award  
2005 AAAS Fellow  
2002-2012 NIH Merit Award  
2000 Cope Scholar Award from the American Chemical Society  
1998-2002 Established Investigator of the American Heart Association  
1997 Pfizer Award in Enzyme Chemistry from the Division of Biological Chemistry of the American  
Chemical Society  
1995-2000 David and Lucile Packard Fellowship in Science and Engineering  
1993-1996 Searle Scholar  
1990-1997 Lucille P. Markey Scholar in Biomedical Science  
1989-1990 Helen Hay Whitney Postdoctoral Fellowship (Colorado)  
1986-1987 Gillette Foundation Fellowship (Brandeis)  
1982 Award for Excellence in Biochemistry (SUNY-Binghamton)  
1982 American Institute of Chemists Award in Biochemistry (SUNY-Binghamton)  
1979 Phi Beta Kappa (Michigan)  
1978, 1979 James B. Angell Scholar (Michigan)

## ACTIVITIES & SERVICE

2020 Panelist, NIH New Innovator Award Seminar  
2019- Editorial Board, Science Advances  
2015-2020 Reviewer, NIH Director's New Innovator Award

2018	Reviewer, NIH Special Emphasis Panel
2017-	Mentor, Stanford SoLID: Solidarity, Leadership, Inclusion, Diversity Mentorship Program
2016-	Advisor, Stanford Institutional Research and Academic Career Development Award
2016-	Member, United Health Council
2016	Reviewer, NIH National Heart, Lung and Blood Institute Intramural Site Visit Review
2015	Reviewer, NIH Center for Systems Biology of RNA
2015, 2018-present	Host, Off-the-Farm ADVANCE Dinner
2015	Reviewer, NIH Biomedical Technology Research Resource (P41)
2014, 2015	Review Panel, NSF: Molecular and Cellular Biosciences
2014, 2015	Reviewer, HHMI International Student Research Fellowships Competition
2012, 2014, 2016	Reviewer, NIH Pioneer Director's Award
2013	Program Theme Organizer, ASBMB
2011-present	Member, Stanford Medical Science Training Program Advisory Committee
2010-2019	Advisory Board, PLoS Biology
2007-2010	Study Section, NIH (MSFE)
2006-present	Editorial Advisory Board, Biopolymers
2005-2010	Advisory Board, Faculty of 1000 Chemical Biology
2005	Organization Committee, Winter Enzyme Mechanisms Conference
2005	Member, Faculty of 1000
2004-2019	Editorial Board, PLoS Biology
2003	Program Planning Committee, ASBMB National Meeting
2002-2003	Member of Board of Directors, RNA Society
1999	Co-chair, Enzymes, Coenzymes and Metabolic Pathways Gordon Conference
1998	Nominating Committee, American Society of Biochemistry and Molecular Biology
1998-2002	Editorial Board, Annual Review of Biochemistry
1998	Co-Vice chair, Enzymes, Coenzymes and Metabolic Pathways Gordon Conference
1996	Co-organizer, Bay Area Enzyme Discussion Group
1995-present	Editorial Board, RNA
1995-2000	Co-organizer, Bay Area RNA Club

## PEER REVIEW ACTIVITIES

### Manuscript Review

Angewandte Chemie, Annual Review of Biochemistry, Biochemistry, Biophysical Journal, Cell, eLife, The EMBO Journal, Inorganic Chemistry, Journal of Molecular Biology, Journal of Organic Chemistry, Journal of Physical Chemistry, Journal of the American Chemical Society, Molecular and Cellular Biology, Molecular Cell, Nature, Nature Chemical Biology, Nature Chemistry, Nature Communications, Nature Methods, Nature Structural & Molecular Biology, Nucleic Acids Research, PLOS Biology, PLOS Computational Biology, PNAS, RNA, Science, Structure, et al.

### Editorial Boards

Annual Review of Biochemistry, Biopolymers, PLOS Biology, RNA, Science Advances

### Grant Review

Biotechnology and Biological Sciences Research Council (U.K.), Department of Energy, HHMI International Student Research Fellowships, National Institutes of Health, National Science Foundation, Research Corp for Scientific Advancement, Wellcome Trust

## UNIVERSITY AND DEPARTMENTAL SERVICE

2011-2015	Senior Associate Dean of Graduate Education and Postdoctoral Affairs
2005-2010, 2020	Member & Co-chair, CGAP (Committee on Graduate Admissions and Policy)
1997-2001, 2018-	Graduate Advisor, Biochemistry Department, Stanford University
1997-1998, 2004,	Chair, Biochemistry Department Graduate Admissions Committee, Stanford University
2005, 2009-2010	
2017-	Inaugural Mentor, Stanford SoLID: Solidarity, Leadership, Inclusion, and Diversity Mentorship Program
2013-2016	Advisory Board Member, Stanford ChEM-H
2021	McCormick and Gabilan Faculty Award Review Committee, Stanford University

2020-	Community Leaders in Mental Health
2020-	Biochemistry Department Diversity Liaison, Stanford University
2020-	Mentor, Stanford NSF Graduate Research Fellowship Program
February 2020	Interviewer, Stanford University Medical Scientist Training Program Admissions
2018-	Faculty Mentoring Champions
May 2016	Participant, Future of Biosciences Graduate and Postdoctoral Training
April 2015	Participant, Stanford Biosciences Student Association, Graduate Student Forum/Town Hall
August 2015	Host, Off-The-Farm ADVANCE Dinner
February 2015	Participant, Stanford Biosciences Student Association Town Hall
January 2015	Participant, Stanford School of Medicine Teaching and Mentoring Academy
2011-2015	Host, Biosciences Orientation Dinner
2015-	Faculty Reviewer, Stanford Biosciences Grant Writing Academy
2015-	Advisory Committee Member, Stanford Institutional Research and Academic Career Development Award (IRACDA)
2014-2015	Member, Search Committee for Junior Faculty Recruitment for the Department of Biochemistry and ChEM-H
October 2014	Participant, STANDOUT “How We Review Applications, GPAs, GREs & Interviews” Panel
2011-present	Member, Stanford Medical Science Training Program Advisory Committee
2011-2015	Speaker, Stanford Biosciences Postdoctoral Scholar Orientation
2011-2015	Speaker, Leadership Lunches, as Senior Associate Dean of Graduate Education and Postdoctoral Affairs

## STUDENT & OTHER OUTREACH ACTIVITIES (PARTIAL LIST)

February 2021	Speaker, SoLID (Solidarity, Leadership, Inclusion, Diversity Mentorship Program) Saloon Series,
September 2019	Table Host, Biosciences Orientation and Welcome Dinner
May 2019	Speaker, SoLID (Solidarity, Leadership, Inclusion, Diversity Mentorship Program) Saloon Series,
May 2019	Speaker, Let’s Have an Awesome Time Doing Science Symposium
December 2018	“Success in Science and Life” Workshop, Chemistry Department, University of Michigan
September 2018	Host, Dinner discussion with ADVANCE Fellows
June 2018	SSRP Summer Program Introduction “My Successful Summer Research Journey”
May 2018	Guest lecturer, Medical Scientist Training Program “Physician Scientist Hour”
February 2018	Stanford Biosciences Lunch & Learn Series “The Surprising Road to Success”
May 2017	Stanford Biosciences Lunch & Learn Series “Goal Setting and Time Management”
February 2017	Stanford Biosciences Lunch & Learn Series “The Surprising Road to Success”
January 2016	Stanford Biosciences Pizza & Beer Workshop Series “Tools for Success, Part II”
November 2015	Stanford Biosciences Pizza & Beer Workshop Series “Tools for Success, Part I”
June 2015	Speaker, “Discussion with the Dean: Being a Successful Scientist”, Stanford Summer Research Program Faculty Talk
May 2015	Opening and Closing Remarks, “Joys and Challenges of Graduate Research” Reception
May 2015	Guest lecturer, Medical Scientist Training Program “Physician Scientist Hour”
May 2015	Speaker, Leadership Lens Associate Professor Academic Chat
April 2015	Participant, SOAR Spring Mentorship Dinner
January 2015	Participant, BioAIMS Community Forum
December 2014	Participant, BioAIMS “Small Acts Matter!” Community Forum
November 2014	“Success in Science and Life” Undergraduate Workshop, Chemistry Dept., University of Maryland, Baltimore County
September 2014	Speaker, Bioengineering Graduate Orientation
	ADVANCE (Advancing Diversity, Excellence
July 2016	Host, Dinner discussion with ADVANCE Fellows
August 2015	Host, Dinner discussion with ADVANCE Fellows
September 2014	Closing Remarks, ADVANCE End of Program Reception
June-August 2011	Biochemistry for High School Students (Informal Course)

## TEACHING ACTIVITIES (PARTIAL)

**2020-2021**

BIOC 227 Connections: Science, Life and Community (Course Director, Lectures and Discussion Leader)

**2019-2020**

BIOC 202 Biochemistry Bootcamp (Lecture & structured activities)  
BIOS 294 Chemistry for Biologists (Mini-course)  
BIOS 263/242 Grant Writing Academy Proposal Bootcamp (Workshop)  
BIOC 360 Developing Original Research (Seminar)

**2018-2019**

BIOS 263/242 Grant Writing Academy Proposal Bootcamp (Workshop)

**2017-2018**

BIOS 263/242 Grant Writing Academy Proposal Bootcamp (Workshop)

**2016-2017**

BIOS 263/242 Grant Writing Academy Proposal Bootcamp (Workshop)

**2015-2016**

BIOC 202 Biochemistry Bootcamp (Lecture)  
BIOC 222 Skills and Practice Leadership (Workshop)  
BIOC 228 Understanding Chemistry in Biology (Workshop)  
BIOS 229 Drug Discovery Simulation (Workshop)  
BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)  
BIOS 242 Writing Compelling Fellowships (Practicum)  
BIOS 243 Grant Writing Academy (Lecture)  
BIOS 250 Interdisciplinary Drug Discovery (Workshop)  
BIOS 263/242 Grant Writing Academy Proposal Bootcamp (Workshop)

**2013-2014**

BIOC 222 Skills and Practice Leadership (Workshop)  
BIOC 228 Understanding Chemistry in Biology (Mini-course)  
BIOS 229 Drug Discovery Simulation (Workshop)  
BIOC 360 Developing Original Research (Seminar)

**2012-2013**

BIOC 241 Biological Macromolecules (Course Director, Lectures and Discussion Leader)  
BIOC 360 Developing Original Research (Seminar)

**2010-2011**

BIOC 241 Biological Macromolecules (Course Director, Lectures and Discussion Leader)

**2009-2010**

BIOC 241 Biological Macromolecules (Course Director, Lectures and Discussion Leader)

**2008-2009**

BIOC 220 Chemistry of Biological Processes (Lectures)  
BIOC 241 Biological Macromolecules (Course Director, Lectures and Discussion Leader)

**2007-2008**

BIOC 220 Chemistry of Biological Processes (Lecture)  
BIOC 241 Biological Macromolecules (Course Director, Lectures and Discussion Leader)

**2006-2007**

BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)

## **2005-2006**

BIOC 220 Chemistry of Biological Processes (Lectures)  
BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)

## **2004-2005**

BIOC 220 Chemistry of Biological Processes (Lectures)  
BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)

## **2003-2004**

BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)

## **2002-2003**

BIOC 214 Physical and Chemical Principles of Biochemistry (Lecture)  
BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)

## **2001-2002**

BIOC 221 The Teaching of Biochemistry (Lecture)  
BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)

## **2000-2001**

BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)

## **1999-2000**

BIOC 241 Biological Macromolecules (Lectures and Discussion Leader)

## **1997-1998**

BIOC 214 Physical and Chemical Principles of Biochemistry (Lectures)

## **1995-1996**

BIOC 201 Advanced Molecular Biology (Lectures)  
BIOC 214 Physical and Chemical Principles of Biochemistry (Lectures)

## **1994-1995**

BIOC 201 Advanced Molecular Biology (Lectures)

## **1993-1994**

BIOC 200 Applied Biochemistry (Lectures)  
BIOC 201 Advanced Molecular Biology (Lectures)

## **PUBLICATIONS (THROUGH 2021)**

282 scientific articles; H-index: 93 (Google Scholar)

[Google Scholar Citations Link](#) and see full publication list below.

## **MEMBERSHIPS**

American Association for the Advancement of Science; American Chemical Society; American Society for Biochemistry and Molecular Biology; Bay Area RNA Club; Biophysical Society; Protein Society; RNA Society.

## **TRAINEES**

### **Postgraduate Trainees:**

1. Ben Allred [2014-2017], current position: Senior Scientist, Elegen
2. Yoav Arava [1999-2002], current position: Associate Professor, Technion Israel Institute of Technology
3. Kogan Bao [2003-2007], current position: Vice President of Biopharmaceutical Development, Molecular Templates
4. Sascha Baumann [2010-2012], current position: Lab Head, Microbiological Category Support, Beiersdorf
5. Marcello Forconi [2003-2009], current position: Associate Professor, College of Charleston
6. Magdalena Gebala [2012-2015], current position: Research Associate in Straight Lab, Stanford University

7. Andre Gerber [2001-2004], current position: Professor, University of Surrey
8. Kristin Gleitsman [2010-2014], current position: Director of Technology Development, Guardant Health
9. Asmita Gupta [2016-2017], current position: Research Associate, Center for DNA Fingerprinting and Diagnostics
10. Inga Jarmoskaite [2014-2019], current position: Postdoctoral Scholar in Li Lab, Stanford University
11. Alexander Kravchuk [1999-2004], current position: Senior Scientist, University of Vienna
12. Vandana Lamba [2013-2016], current position: Senior Scientist, IGM Biosciences, Inc.
13. Jonathan Lassila [2007-2012], current position: Scientist and Leader of Enzymology and Structural Biology Group, DuPont Industrial Biosciences
14. Jia Liu [2006-2008], current position: Director of Business Development, MGI
15. Jon Lorsch [1995-1999], current position: Director, National Institute of General Medical Sciences
16. Karen Maegley [1994-1996], current position: Associate Research Fellow, Pfizer
17. Rui Mei [1993-1996], current position: Chief Scientific Officer, CellMax Life
18. Emilia Mollova [2001-2004], current position: Senior Staff Scientist, Pacific Biosciences
19. Alessio Peracchi [1994-1997], current position: Associate Professor, University of Parma, Italy
20. Rishi Porecha [2009-2010], current position: Global Product Manager, Illumina, Inc.
21. Eliza Ruben [2007-2012], current position: Director, University of Oklahoma Protein Production Core Facility
22. Rick Russell [1997-2002], current position: Associate Professor, University of Texas at Austin
23. Bernard Sattin [2005-2007], current position: Director of Medical Information, Janssen, Inc.
24. Jason Schwans [2004-2012], current position: Associate Professor, California State University, Long Beach
25. Xuesong Shi [2007-2012]
26. Sergey Solomatin [2005-2010], current position: Vice President of Research, Materials and Texture, Impossible Foods, Inc.
27. Raashi Sreenivasan [2017], Scientist, RAPT Therapeutics
28. Joseph K. Tang [2003-2004], current position: Adjunct Faculty, Capital University
29. Kevin Travers [2001-2005], current position: Vice President, Research and Development, LevitasBio
30. Pavanapuresan Vaidyanathan [2014-2015], current position: Platform Technology Lead, Protillion Biosciences
31. Shenglong Wang [1996-2001], current position: Quality Engineer IV, Bio-Rad Laboratories
32. Filip Yabukarski [2014-2020], current position: Scientist, Chan Zuckerberg BioHub
33. Shan Yang [2014-2015], current position: Fellow, Novartis
34. Mason Appel (current postdoc, joint appointment with Polly Fordyce lab, 2017-present)
35. Lauren Hagler (current postdoc, 2020-present)
36. Craig Markin (current postdoc, joint appointment with Polly Fordyce lab, 2015-present)
37. David White (current postdoc, joint appointment with Aaron Hoskins lab, 2021-present)

#### **Graduate Students:**

1. Suzanne Admiraal [1993-1999], current position: Senior Research Lab Specialist, University of Michigan, Ann Arbor
2. Logan Andrews [2006-2012], current position: Project Leader, Startup
3. Yu Bai [2001-2007], current position: Data Scientist, Regeneron Pharmaceuticals
4. Laura Bartley [1996-2001], current position: Associate Professor, Washington State University
5. Tara Benz-Moy [2006-2012], current position: Adjunct Lecturer, Butler University
6. Namita Bisaria [2009-2015], current position: Senior Scientist, Myeloid Therapeutics
7. Steve Bonilla [2012-2019], current position: Postdoctoral Scholar in Kieft Lab, University of Colorado, Anschutz Medical Campus
8. Rhiju Das [2000-2005], current position: Associate Professor, Stanford University
9. Mark Engelhardt [2002-2006], current position: Partner, Ovodenovo Scientific Consulting
10. Seshadri Gowrishankar [2014-2016], Scientist, Impossible Foods
11. Max Greenfeld [2005-2012], current position: Software Engineer and Informatics Lead, Q Bio
12. Dan Hogan [2002-2009], current position: Research Fellow, Impossible Foods
13. Greg Hogan [2007-2014], current position: Senior Manager of Development, Freenome
14. Katrin Karbstein [1997-2003], current position: Professor, Scripps Research Institute
15. Daniel Kraut [2000-2006], current position: Associate Professor, Villanova University
16. Ariana Peck [2013-2018], current position: Project Scientist, SLAC National Accelerator Laboratory
17. Felix Mueller-Planitz [2000-2006], current position: Professor, Technical University Dresden
18. Geeta Narlikar [1992-1998], current position: Professor, University of California, San Francisco
19. Aditya Natarajan [2009-2015], current position: Engagement Manager, L.E.K. Consulting

20. Ivana Nikolic-Hughes [1999-2005], current position: Associate Director for Frontiers of Science and Lecturer, Columbia University
21. Patrick O'Brien [1994-2000], current position: Associate Professor, University of Michigan, Ann Arbor
22. Matthew Peck [1995-2001], current position: Academic Coordinator, Washington State University
23. Raghuvir Sengupta [2009-2016], current position: Biochemist, HP Labs
24. Shu-ou Shan [1994-2000], current position: Altair Professor, California Institute of Technology
25. Paul Sigala [2002-2009], current position: Assistant Professor, University of Utah
26. Breena Stoner [2011-2015], current position: Senior Safety Engineer, Caltech
27. Helen Wiersma-Koch [2004-2013], current position: Assistant Professor, Indian River State College
28. Deborah Wilkerson (Knitt) [1992-1998], current position: Senior Director Medical Affairs, Medtronic
29. Jesse Zalatan [2002-2008], current position: Assistant Professor, University of Washington
30. Eliel Akinbami (current graduate student, 2019-present)
31. Daniel Mokhtari (current MD/PhD student, joint appointment with Polly Fordyce Lab, 2016-present)
32. Margaux Pinney (current graduate student, 2014-present)
33. Catherine Stark (current graduate student, 2016-present)
34. Gabriel Tauber (current graduate student, 2019-present)

#### **Undergraduate Students:**

1. Medinat Akindede [2018], current position: Undergraduate student, University of Minnesota
2. Jamar Borland [2013], current position: Undergraduate student, University of Central Florida
3. Clayton Brown [2013], current position: Consultant, Boston Consulting Group
4. John Eugenis [2015], current position: Graduate student, Stanford University
5. Nathan Gamarra [2011], current position: Postdoctoral Researcher, Genentech
6. Cyrus Jin [2014], current position: Research Assistant, University of California, Los Angeles
7. Mable Lam [2010], current position: Postdoctoral Researcher, Stanford University
8. Quan Lam [2015], current position: Graduate Research Associate, University of Illinois, Urbana-Champaign
9. Ben Lerner [2014], current position: Senior Mechanical Engineer, Ono Food Co.
10. Merouane Ounadjela [2014]: current position: Life Science Tools and Diagnostics Equity Research Intern, JP Morgan Chase & Co.
11. Jacob Parres-Gold [2020]: current position: Undergraduate Student, Cal State Los Angeles
12. Zora Singh [2013], current position: Graduate student, Johns Hopkins University
13. Matthew Sonnet [2012], current position: Graduate student, Harvard University

#### **High School Students:**

1. Teanna Bautista-Leung [2019-2020], current position: Undergraduate student, University of California, San Diego
2. Elizabeth Burnette [2014], current position: Graduate student, University of California Los Angeles
3. Emily Burnette [2015, 2016], current position: Fixed Income and Derivatives Analyst, NISA Investment Advisors, LLC
4. Jenny Lu [2012]
5. Gina Hall [2014], current position: Transaction Support Specialist, Windermere Realty Trust
6. Noah Hashmi [2014], current position: Software Engineer, Google
7. Hannah Rosenfeld [2011], current position: Graduate Research Assistant, University of Michigan, Ann Arbor
8. Vedika Shenoy [2017], current position: Undergraduate student, University of California, Santa Barbara
9. Abitha Thiru [2014], current position: Program Manager, Round Feather, Inc.
10. Varun Venkatesh [2015, 2016, 2017], current position: Undergraduate student, Columbia University

## **GRANT SUPPORT**

### **Current Research Support**

(Fordyce)

09/01/19-06/30/24

Ono Pharma Foundation

"High-throughput microfluidic enzyme kinetics to identify and manipulate allosteric handles for enzyme control"

The goal of this study is to modify residues at distal surfaces revealed to be functionally connected to the active site, we will directly test the degree to which functional networks can be leveraged for catalytic control.

**R01GM064798** (Herschlag with 1 Co-PI, 1 Co-Investigator)

07/01/19-06/30/23

NIH

**“Quantitative, High-throughput Mechanistic Enzymology”**

The goal of this project is to develop high-throughput, quantitative enzyme assays that can deliver standard kinetic and thermodynamic constants and to apply this technology to Alkaline Phosphatase superfamily members and other enzyme systems.

**R01GM132899** (Herschlag with 1 Co-PI, 1 Co-Investigator)

05/01/19-02/28/23

NIH

**“Fundamental Studies of RNA Conformational Thermodynamics”**

The goal of this project is to develop and test a quantitative and predictive model for RNA folding thermodynamics and kinetics in vitro to provide fundamental physical understanding of RNA and its potential and to guide experiments with an engineering of structured RNAs.

**MCB-1714723** (Herschlag with 3 Co-PI's)

08/01/17-07/31/21

NSF

**“Collaborative Research: Systematic Investigation of the Structure, Dynamics, and Energetics of Hydrogen Bonds and the Protein Interior Using Ketosteroid Isomerase and Model Systems”**

The goals of this project are to explore hydrogen bond structure and energetics in proteins and model systems in order to develop a predictive framework and generalizable tools and to develop QM/MM models in deep synergy with experimental tests.

**Past Research Support:**

**2U54GM103297-06** (Herschlag)

04/01/18-03/31/20

University of Michigan/NIH

**“High-throughput Dissection of HIV RNA Ligand Affinity and Specificity”**

The goal of this project is to provide large amounts of quantitative information about ligand/RNA affinities and conformational preferences for a subset of HIV RNA motifs.

**P01 GM66275** (PI: Herschlag with 5 Co-PI's)

04/01/13-03/31/20

NIH/NIGMS

**“Fundamental Studies of RNA Folding”**

The goal of this project is to understand the folding pathways and mechanisms of a single RNA via multifaceted biophysical and biochemical and computational approaches.

**IIP8-63** (Herschlag with 1 Co-PI)

10/01/16-09/30/18

Bio-X

**“High-Throughput Quantitative Enzymology: Developing and Deploying a Novel Microfluidic Platform”**

**70NANB15H268** (PI: Fordyce)

10/10/15-09/30/18

National Institute of Standards and Technology

Seed Grant

**“Developing and Deploying a Novel Microfluidic Platform for High-Throughput Quantitative Enzymology”**

**R01 GM49243** (PI: Herschlag)

08/01/13-04/30/18

NIH/ NIGMS

**“Enzymology of Catalytic RNA Molecule”**

**MCB-0641393** (PI: Herschlag)

08/15/11-07/31/17

NSF

**“Mechanistic Investigations of Ketosteroid Isomerase”**

**5R01HG00436106** (PI: Chang)

09/18/07-05/31/15

NIH

**“Structural Motifs in RNA”**



<b>R01 GM64798</b> (PI: Herschlag) NIH/NIGMS "Study of Enzymatic Phosphoryl Transfer"	04/01/09-01/31/14
<b>MCB0641393</b> (PI: Herschlag) NSF "Mechanistic Investigations of Ketosteroid Isomerase"	06/01/07-05/31/11
<b>5U54GM07297009</b> (PI: Delp) NIH "Physics-based Simulation of Biological Structures"	09/15/04-08/31/15
<b>5P01 GM06627508</b> (PI: Herschlag with 7 Co-PI's) NIH Fundamental Studies of RNA Folding *NIH Merit Award, 2002-2012	06/06/03-03/31/18
<b>9740098N</b> (PI: Herschlag) American Heart Association "Mechanistic Investigations of the Hammerhead Ribozyme"	01/01/98-12/31/02
<b>5R01CA07709713</b> (PI: Brown) NIH "Gene Expression In Cancer by Microarray Hybridization"	09/30/97-03/31/12
<b>200001671</b> (PI: Herschlag) The David and Lucile Packard Foundation "Single Molecular Analysis of Biological Processes: From Simple to Complex"	10/01/95-09/30/00
<b>93A110</b> (PI: Herschlag) Searle Scholar Award: The Chicago Community Trust "Reactions Catalyzed by the Tetrahymena Ribozyme: Transition State Structure and Stabilization"	07/01/93-06/30/96
<b>9243</b> (PI: Herschlag) Lucille P. Markey Charitable Trust "Mechanism of Catalysis of Biological Phosphoryl Transfer Reactions"	07/01/92-06/30/98
<b>Training Grants:</b>	
<b>1T32GM120007</b> (PI: Carolyn Bertozzi) NIH "Stanford ChEM-H Chemistry/Biology Interface Predoctoral Training Program"	07/01/16-06/20/21
<b>1T32GM11385401</b> (PI: Mochly-Rosen) NIH "Molecular Pharmacology Training Program"	07/01/15-06/30/20
<b>70NANG15H192</b> (PI: Sidow and Cochran) NIH "National Institute of Standards and Technology"	09/01/15-08/31/19
<b>5T32GM00727640</b> (PI: Cyert) NIH "Cellular and Molecular Biology Training Program"	07/01/08-06/30/19
<b>5T32GM00829427</b> (PI: Pande)	07/01/07-06/30/17

NIH  
"Molecular Biophysics Training Program"

GT32GM008412REV (PI: Swartz)

07/01/91-06/30/11

NIH  
"Graduate Training in Biotechnology"

5T32GM0759917 (PI: Spudich)

07/01/83-09/30/95

NIH  
"Training Program in Biochemistry"

## SELECTED INVITED SEMINARS

**Gordon Conferences:** Biomolecular Recognition and Immobilization, Brewster Academy, Wolfeboro, NH, August 1994; Bioorganic Chemistry, Plymouth State College, Plymouth, NH, June 1994; Isotopes in the Physical and Life Sciences, Ventura, CA, February 1996; Nucleic Acids, New Hampton School, New Hampton, NH, June 1996; Bioorganic Chemistry, Proctor Academy, Andover, NH, June 1998; Nucleic Acids, Salve Regina University, Newport, RI, June 1998; Metals in Biology, Ventura, CA, January 1999; Enzymes, Kimball Union Academy, Meriden, NH, July, 2000; Molecular Genetics, Connecticut College, New London, CT, July, 2000; Physical Organic Chemistry, Holderness School, Holderness, NH, July, 2001; Nucleic Acids, Roger Williams University, Bristol, RI, June, 2002; Molecular Genetics, Connecticut College, New London, CT, July, 2002; Single Molecule Approaches to Biology, Colby-Sawyer College, New London, NH, June, 2006; Nucleic Acids, Salve Regina University, Newport, RI, June, 2007; Enzymes, Coenzymes & Metabolic Pathways, Waterville Valley, NH, 2009; Biopolymers, Salve Regina University, Newport, RI, June 2012; Bioorganic Chemistry, Proctor Academy, Andover, NH, June 2013; Post-Transcriptional Gene Regulation, Salve Regina University, Newport, RI, July 2014; Enzymes, Coenzymes & Metabolic Pathways, Waterville Valley, NH, July 2015; Nucleic Acid Architectures for Therapeutics, Diagnostics, Devices and Materials, Ventura, CA, January 2019

**Selected Meetings:** Workshop on Site-specific Recombination and Transposition, Woods Hole, September 1994; Keystone Symposium: "Ribozymes: Basic Science and Therapeutic Applications", Jan. 1995; Table Ronde Roussel Uclaf: "Structural Basis of Enzymatic Activity in Enzymes and Ribozymes", Paris, May 1995; NATO Advanced Research Workshop: "Bioorganic Chemistry", Pennsylvania, May 1995; Repligen Award Symposium for W.P. Jencks, ACS meeting, August 1996; Novel Biocatalysts Workshop, Instituto Juan March, Madrid, Spain, March 1997; Chemistry in Biology Symposium, Salk Institute, San Diego, January 1998; 27th Reaction Mechanisms Conference, Asilomar, CA, June 1998; Phosphoryl Transfer: A Molecular Basis for Signaling, Lake Tahoe, CA, October 1998 (ASBMB); ASBMB National Meeting, San Francisco, May, 1999; RNA Biochemistry, Bavaria, Germany, November, 1999; NIH Workshop on Single Molecule Techniques, Bethesda, MD, April, 2000; RNA Structure Symposium, Santa Cruz, CA, July, 2000; Symposium in Molecular Biology, RNA and Protein Folding, Penn State University, August, 2000; Cope Scholar Award, ACS, Washington, DC, August, 2000; ASBMB National Meeting, New Orleans, LA, April, 2002; Ribozymes & RNA Catalysis: International Workshop, Dundee, Scotland, August, 2002; Enzyme Mechanisms Conference, Galveston, TX, January, 2003; Biophysical Society Annual Meeting, San Antonio, TX, March, 2003; ACS Meeting, Frontiers in Enzymology, New York, September, 2003; FASEB Conference on Nucleic Acid Enzymology, June, 2004; The 19<sup>th</sup> Enzyme Mechanism Conference, Pacific Grove, CA, January, 2005; Cold Spring Harbor Systems Biology Meeting, March, 2005; Ohio State MBI Enzyme Dynamics Workshop, OH May, 2005; ACS Meeting, Frontiers in RNA Catalysis, Washington D.C., August, 2005; Keystone Symposium on Nucleic Acid Enzymes, Taos, NM, February, 2006; Biophysical Society, RNA Folding and Unfolding, Salt Lake City, UT, February, 2006; FASEB Conference, Post-Transcriptional Control of Gene Expression: Mechanisms of mRNA Decay, Snowmass, CO, June, 2006; ACS Meeting, Division of Biological Chemistry, Enzymatic Catalysis and Transition States, Repligen Award Symposium (Vern Schramm), San Francisco, September, 2006; ACS Meeting, Division of Physical Chemistry, RNA Folding, Chicago, March, 2007; University of Sheffield, UK, NACON VII, April, 2007; ASBMB National Meeting, Translational Control, Washington D.C., May, 2007; ACS Meeting, Division of Physical Chemistry; Award in Pure Chemistry Symposium (Xiaowei Zang), Boston, August, 2007; Protein Dynamics and Catalysis Conference, NY May 2008; FASEB National meeting, Nucleic Acid Enzymes, June 2008; ASBMB, William C. Rose Award Lecture, April 2010; Telluride Science Research Center Workshop: Toward Meaningful Analysis of Phosphoryl Transfers and RNA Catalysis: Experiments and Computations, June 2010; RNA Society Platform Talk, Annual Meeting, Seattle, WA, June 2010; ACS National Meeting, Repligen Symposium, Philadelphia, August 2012; 245th ACS National Meeting, Frontiers in RNA Catalysis and Folding: Interface of Theory and Experiment, New Orleans, LA, April 2013; ASBMB Annual Meeting, RNA Function and Protein Synthesis, Boston, MA, April 2013; The Role of Dynamics in Enzyme Catalyzed Reactions, Telluride Science Research Center, Telluride, CO, July 2013; Biochemical Society Single Biomolecules Meeting, Hertfordshire, UK, September 2014; Novel Enzymes, Ghent, Belgium,

October 2014; The Role of Dynamics in Enzyme Catalyzed Reactions, Telluride, CO, August 2015; North Carolina Symposium on RNA Biology XI, Durham, NC, October 2015; 24<sup>th</sup> Solvay Conference, on Chemistry, Catalysis in Chemistry and Biology, October 2016; Challenges in Dissecting and Understanding Nucleic Acid, Telluride Science Research Center, Telluride, CO, June 2017; Protein Folding Dynamics and Stability Meeting, Halle, DE, October 2017; National Cancer Institute at Frederick, November 2019; Biophysical Society Annual Meeting, San Diego, CA, February 2020; Volcano Conference in Chemical Biology, Eatonville, WA, February 2020

**Selected University Seminars:** UCSF, Pharmaceutical Chemistry, April 1994; University of California, Berkeley, Structural Biology, April 1994; Scripps Research Institute, December 1994; Harvard University, Medical School, Genetics Department (MGH), February 1995; University of California, San Francisco, Biochemistry and Biophysics, October 1995; Columbia, Biochemistry and Biophysics, November 1995; Johns Hopkins University, Biochemistry and Biophysics, February 1998; Yale University, Biochemistry and Biophysics, November 1998; University of California, Berkeley, Structural Biology, April, 1999; Harvard University, Molecular and Cell Biology, Cambridge, MA, December, 1999; Harvard University Medical School, Cambridge, MA, January, 2000; UCSF, Biochemistry and Biophysics, January, 2001; MIT, Department of Chemistry, Biological Chemistry Division, February, 2001; Dowd Lectures, University of Pittsburgh, Chemistry Department, April, 2001; Cal Tech, Department of Chemistry, May, 2001; Boehringer Ingelheim Research Lecture, Univ. of British Columbia, Chemistry Department, February, 2002; Scripps Research Institute, Structure & Chemistry Affinity Group Seminar Series, May 2002; CalTech Physics Colloquium, March, 2003; Cal Tech, Department of Chemistry, April, 2005; MIT/CSBi, December, 2005; UC Berkeley, Structural and Quantitative Biology, March, 2006; Princeton University, Lewis-Sigler Institute, April, 2006; University of Chicago, May, 2007; University of Texas, Southwestern Medical Center, April, 2008; Columbia University, Department of Biological Sciences, December 2008; Tiselius Symposium on Horizons in Biochemistry, Uppsala University, Sweden, October 2008; University of Michigan, Department of Biological Chemistry, March, 2009; Powered by NCBC Scientific Lecture, NIH April 2009; University of Manchester Interdisciplinary Biocentre International Seminar, April 2010; UCSF, California Institute for Quantitative Biosciences (QB3) Invitational Speaker Series, April 2010; CalTech, Department of Chemistry, April 2010; University of Pittsburgh, Department of Structural Biology, May 2010; Yale University, Joe Coleman Memorial Lecture, December 2011; Keynote Speaker, BECUR Undergraduate Conference, University of Arizona, February 2012; Molecular Biophysics Training Program Seminar, Student-invited speaker, UC San Diego, May 2012; College of Sciences Distinguished Speaker Series, Orlando, FL, September 2012; University of Wisconsin-Madison, David E. Green Lecture in Enzyme Chemistry, March 2014; Case Western Reserve University, Student invited guest seminar for Harland Lecture series, April 2014; University of Rochester, Department of Biochemistry and Biophysics seminar series, April 2014; University of Maryland Baltimore County, November 2014; University of Pennsylvania, February 2016; Keynote at 29<sup>th</sup> Annual Mary and Randolph T. Wedding Research Symposium, University of California, Riverside, September 2016; Interdisciplinary Life Science Seminar Series Speaker, University of Zurich, December 2016; Cell Biology Department Student-invited Seminar, Harvard University, February 2017; Department of Chemistry and Biochemistry, University of Colorado, Boulder, April 2017; Department of Chemistry, Dartmouth University, April 2017; Biochemistry Seminar Series, Louisiana State University Health Sciences Center, December 2017; Structure and Quantitative Biology Seminar Series, University of California, Berkeley, January 2018; Moses Gomberg Lecture, University of Michigan, December 2018; Molecular Biophysics Symposium, Northwestern University, September 2019

## PUBLICATIONS ( 282 )

H-index: 92 (Google Scholar) [Google Scholar Citations Link](#)

1. Herschlag, D., Stevens, E.S. and Gander, J.E. (1983) **Int. J. Peptide Prot. Res.** 22, 16-20. "Galactofuranosyl-containing Glycopeptide of *Penicillium charlesii*: Vacuum Ultraviolet Circular Dichroism." PMID: 6224750.
2. Jencks, W.P., Haber, M.T., Herschlag, D. and Nazaretian, K.L. (1986) **J. Am. Chem. Soc.** 108, 479-483. "Decreasing Reactivity with Increasing Nucleophile Basicity. The Effect of Solvation on  $\beta_{\text{nuc}}$  for Phosphoryl Transfer to Amines." PMID: 22175464.
3. Herschlag, D. and Jencks, W.P. (1986) **J. Am. Chem. Soc.** 108, 7938-7946. "Pyrophosphate Formation from Acetyl Phosphate and Orthophosphate Anions in Concentrated Aqueous Salt Solutions Does Not Provide Evidence for a Metaphosphate Intermediate."
4. Herschlag, D. and Jencks, W.P. (1987) **J. Am. Chem. Soc.** 109, 4665-4674. "The Effect of Divalent Metal Ions on the Rate and Transition State Structure of Phosphoryl Transfer Reactions."
5. Herschlag, D. (1988) **Bioorganic Chemistry** 16, 62-96. "The Role of Induced Fit and Conformational Changes of Enzymes in Specificity and Catalysis."
6. Herschlag, D. and Jencks, W.P. (1989) **J. Am. Chem. Soc.** 111, 7579-7586. "Evidence That Metaphosphate is Not an Intermediate in Solvolysis Reactions in Aqueous Solution."
7. Herschlag, D. and Jencks, W.P. (1989) **J. Am. Chem. Soc.** 111, 7587-7596. "Phosphoryl Transfer to Oxyanions: The Nature of the Transition State and Electrostatic Repulsion."
8. Herschlag, D. and Jencks, W.P. (1990) **J. Am. Chem. Soc.** 112, 1942-1950. "The Effect of  $\text{Mg}^{2+}$ , Hydrogen Bonding and Steric Factors on Rate and Equilibrium Constants for Phosphoryl Transfer between Carboxylate Ions and Pyridines."
9. Herschlag, D. and Jencks, W.P. (1990) **J. Am. Chem. Soc.** 112, 1951-1956. "Nucleophiles of High Reactivity in Phosphoryl Transfer Reactions:  $\alpha$ -Effect Compounds and Fluoride Ion."
10. Herschlag, D. and Jencks, W.P. (1990) **Biochemistry** 29, 5172-5179. "Catalysis of the Hydrolysis of Phosphorylated Pyridines by  $\text{Mg}(\text{OH})^+$ : A Possible Model for Enzymatic Phosphoryl Transfer." PMID: 2378873.
11. Herschlag, D. and Cech, T.R. (1990) **Nature** 344, 405-409. "DNA Cleavage Catalysed by the Ribozyme from *Tetrahymena*." PMID: 1690858.
12. Herschlag, D. and Cech, T.R. (1990) **Biochemistry** 29, 10159-10171. "Catalysis of RNA Cleavage by the *Tetrahymena thermophila* Ribozyme. 1. Kinetic Description of the Reaction of an RNA Substrate Complementary to the Active Site." PMID: 2271645.
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14. Herschlag, D., Piccirilli, J.A. and Cech, T.R. (1991) **Biochemistry** 30, 4844-4854. "Ribozyme-catalyzed and Non-enzymatic Reactions of Phosphate Diesters: Rate Effects upon Substitution of Sulfur for a Non-bridging Phosphoryl Oxygen Atom." PMID: 2036355.
15. Herschlag, D. (1991) **Proc. Natl. Acad. Sci. U.S.A.** 88, 6921-6925. "Implications of Ribozyme Kinetics for Targeting the Cleavage of Specific RNA Molecules *In Vivo*: More Isn't Always Better." PMID: 1871108.
16. Young, B., Herschlag, D. and Cech, T.R. (1991) **Cell** 67, 1007-1019. "Mutations in a Nonconserved Sequence of the *Tetrahymena* Ribozyme Increase Activity and Specificity." PMID: 1959129.

17. Herschlag, D. (1992) **Biochemistry** 31, 1386-1399. "Evidence for Processivity and Two-Step Binding of the RNA Substrate From Studies of J1/2 Mutants of the *Tetrahymena* Ribozyme." PMID: 1736996.
18. Cech, T.R., Herschlag, D., Piccirilli, J.A. and Pyle, A.M. (1992) **J. Biol. Chem.** 267, 17479-17482. "RNA Catalysis by a Group I Ribozyme. Developing a Model for Transition State Stabilization." PMID: 1381347.
19. Legault, P., Herschlag, D., Celander, D.W. and Cech, T.R. (1992) **Nucleic Acids Res.** 20, 6613-6619. "Mutations at the Guanosine-binding Site of the *Tetrahymena* Ribozyme Also Affect Site-specific Hydrolysis." PMID: 1480482.
20. Herschlag, D., Eckstein, F. and Cech, T.R. (1993) **Biochemistry** 32, 8299-8311. "Contributions of 2' Hydroxyl Groups of the RNA Substrate to Binding and Catalysis by the *Tetrahymena* Ribozyme. An Energetic Picture of an Active Site Composed of RNA." PMID: 7688572.
21. Herschlag, D., Eckstein, F. and Cech, T.R. (1993) **Biochemistry** 32, 8312-8321. "The Importance of Being Ribose at the Cleavage Site in the *Tetrahymena* Ribozyme Reaction." PMID: 7688573.
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#### **Publications as an Independent Investigator (7/92-Present)**

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24. McConnell, T.S., Cech, T.R. and Herschlag, D. (1993) **Proc. Natl. Acad. Sci. U.S.A.** 90, 8362-8366. "Guanosine Binding to the *Tetrahymena* Ribozyme: Thermodynamic Coupling with Oligonucleotide Binding." PMID: 8378306.
25. Tsuchihashi, Z., Khosla, M. and Herschlag, D. (1993) **Science** 262, 99-102. "Protein Enhancement of Hammerhead Ribozyme Catalysis." PMID: 7692597.

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26. Hertel, K. J., Herschlag, D. and Uhlenbeck, O.C. (1994) **Biochemistry** 33, 3374-3385. "A Kinetic and Thermodynamic Framework for the Hammerhead Ribozyme Reaction." PMID: 8136375.
27. Herschlag, D. and Khosla, M. (1994) **Biochemistry** 33, 5291-5297. "Comparison of pH Dependencies of the *Tetrahymena* Ribozyme Reactions with RNA 2'-Substituted and Phosphorothioate Substrates Reveals a Rate-limiting Conformational Step." PMID: 8172903.
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30. Knitt, D.S., Narlikar, G.J. and Herschlag, D. (1994) **Biochemistry** 33, 13864-13879. "Dissection of the Role of the Conserved G•U Pair in Group I RNA Self-splicing." PMID: 7947795.
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34. Hollfelder, F. and Herschlag, D. (1995) **Biochemistry** *34*, 12255-12264. "The Nature of the Transition State for Enzyme-catalyzed Phosphoryl Transfer. Hydrolysis of *O*-Arylphosphorothioates by Alkaline Phosphatase." PMID: 7547968.
35. Admiraal, S.J. and Herschlag, D. (1995) **Chemistry and Biology** *2*, 729-739. "Mapping the Transition State for ATP Hydrolysis. Implications for Enzymatic Catalysis." PMID: 9383480.

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