

Mary Elana Hatcher-Skeers

Professor of Chemistry
The Claremont Colleges
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PROFESSIONAL PREPARATION

Bachelor of Arts in Biochemistry and Cell Biology & Minor in English Literature (1988)
University of California at San Diego, San Diego CA

Master of Science in Chemistry (1991)

San Francisco State University, San Francisco CA

Doctor of Philosophy in Physical Chemistry (1996)

University of Washington, Seattle WA

NIH Postdoctoral Associate,

Brandeis University, Waltham MA & Massachusetts Institute of Technology, Cambridge, MA
(1996 – 1998)

APPOINTMENTS

Sidney J. Weinberg, Jr. Chair in Natural Sciences, Scripps College, Claremont CA

2013-present

Professor of Chemistry, Joint Science Department, The Claremont Colleges, Claremont CA

May 2009-present

Adjunct professor of Women's Studies, Scripps College

2008-present

Associate Professor of Chemistry, Joint Science Department, The Claremont Colleges,
Claremont CA

2002-present

Assistant Professor of Chemistry, Joint Science Department, The Claremont Colleges,
Claremont, CA

1998 – 2002

GRANTS/Funding

National Institutes of Health, Academic Research Enhancement Award – PI 1999-2003

“DNA Structure and Dynamics in BamHI-DNA Interactions” \$136,142

ACS PRF Type G Supplement – PI

Summer 2002

“Structural Studies of Hydrogen Bonding in Nucleic Acids via Solid-State NMR” \$8000

National Institutes of Health, Academic Research Enhancement Award 2006-2010

“Dynamic ³¹P NMR of Backbone Dynamics in DNA” \$170,218

National Science Foundation Major Research Instrumentation Grant 2009-2010

“Acquisition of a 500 MHz NMR to Support Teaching and Research with Undergraduates”

\$417,000

W.M. Keck Foundation Research Grant

“Spectroscopic Studies of DNA Structure and Dynamics”

\$15,000

Sidney J. Weinberg, Jr. Chair in Natural Science

2013-2023

\$100,000

National Science Foundation

2017-2020

“NMR Crystallography: Linking Chemical Structure and Dynamics to Enzyme Mechanism”,
Leonard Mueller, PI. MHS is participating as an expert collaborator and will receive \$5000/year
plus funding for student researchers.

AWARDS AND HONORS

Scripps College

Mary W. Johnson Faculty Achievement Award in Service (AY 2012-2013)
Mary W. Johnson Faculty Achievement Award in Teaching (AY 1999-2000 & 2002-2003)
Mary W. Johnson Faculty Achievement Award in Research (AY 1998-1999, 2000-2001 & 2008-2009)
Clare Boothe Luce Chair of Chemistry (1999-2004)
Sidney J. Weinberg, Jr. Chair of Natural Sciences (2013-2023)

Brandeis University

National Institutes of Health Postdoctoral Fellowship (1996-1998)

RELEVANT PROFESSIONAL ACTIVITIES AND SOCIETIES

Presenter, the Association of American Colleges and Universities (AAC&U) STEM Education Conference, Boston MA Fall 2016

American Chemical Society Committee on Professional Training (CPT) Visiting Associate, 2015-present.

Chemistry Department Reviewer, Lewis and Clark College, Portland OR, 2015

Participant, the Council of Independent Colleges/Walmart Foundation Symposium on First-Generation College Students, Baltimore MD Summer, 2014

Participant, AALAC Faculty Workshop on Learning and Teaching Physical Sciences in the Liberal Arts College, Carleton College, November 2011

Participant, NSF ADVANCE workshop on Horizontal Mentoring of Senior Women in Chemistry and Physics at Liberal Arts Colleges, Summer 2010

Participant, Mellon 23 Workshop on Student-Faculty Research Collaboration, Winter 2008

Member, Biophysical Society

Member, American Chemical Society

Visiting Associate for the Committee on Professional Training (review Chemistry Departments for ACS accreditation); appointed summer 2015

Member, Sigma Xi

PUBLICATIONS

*undergraduate authors indicated in bold type.

Books, chapters, essays, reviews

Hatcher-Skeers, M. *"The Pitzer College 50th Anniversary Engaged Faculty Collection: Community Engagement & Activist Scholarship"*, **2014**, Tess Hicks Peterson, editor

Doucleff, M., Hatcher-Skeers, M.E., Crane, N. "Pocketguide to Biomolecular NMR", Springer, New York, February **2011**.

Hatcher-Skeers, M.E. essay "*Reality Check*" Inside Higher Education, July 25, **2008**.

Hatcher-Skeers, M. E. invited book review "*Annual Reports on NMR Spectroscopy, volume 48*", J. Amer. Chem. Soc., **2003**, 125, 6339.

Hatcher-Skeers, M. E., Expert Consultant for *Grolier's New Book of Popular Science*, Spring **1999**.

Hatcher, M.E. and Plachy, W.Z. "*Solubility - Diffusion of Oxygen in the Skin*" in Oxidative Stress in Dermatology, eds., Jurgen Fuchs and Lester Packer, Marcel-Dekker, New York, **1993**.

Peer reviewed journal articles

Khan, T.R.; Jordan, B.; Levitan, R.; Mitchell, P.S.; Wood, C.; Hatcher, M.E., "An FTIR Investigation of Flanking Sequence Effects on the Structure and Flexibility of DNA Binding Sites", *Biochemistry*, **2009**, 48, 1315-1321.

Tian, Y.; **Kayatta, M.; Shultis, K.; Gonzalez, A.**; Mueller, L.J.; Hatcher, M.E., "³¹P NMR

Investigation of Backbone Dynamics in DNA Binding Sites”, Journal of Physical Chemistry B, **2009**, 113, 2596-2603.

Leskowitz, G.M.; Ghaderi, N.; Olsen, R.A.; **Pederson, K.**; Hatcher, M.E.; Mueller, L.J., “The Amide Rotational Barriers in Isonicotinamide: NMR and *Ab Initio* Studies”, Journal of Physical Chemistry A, **2004**, 109, 1152-1158.

Olsen, R.; **Liu, L.**; Ghaderi, N.; **Johns, A.**; Hatcher, M. E.; and Mueller, L. “The Amide Rotational Barrier in Picolinamide and Nicotinamide: *NMR and Ab Initio Studies*”, *J. Amer. Chem. Soc.*, **2003**, 125, 10125-10132.

Hatcher, M.E. and Aragon, E.P. “*Combining Active Learning with Service Learning: A Student-Driven Demonstration Project*”, *J. Chem. Educ.*, **2002**, 79, 462-464.

Hatcher, M.E.; Hu, J.G.; Belenky, M.; Verdegem, P.; Lugtenburg, J.; Griffin, R.G.; and Herzfeld, J. “*Control of the Pump Cycle in Bacteriorhodopsin: Mechanisms Elucidated by Solid State NMR of the D85N Mutant*”, *Biophysical Journal*, **2002**, 82, 1017-1029.

Hatcher, M.E., Le Trong, I., Stenkamp, R., and Drobny, G.P. “*The Local Dynamics of the CpG Step in a DNA Crystal*”, *J. Amer. Chem. Soc.* **2001**, 123, 8874-8875.

Geahigan, K. B., Meints, G. M., Hatcher, M. E., Orban, J. O., and Drobny, G. P. “*The Dynamic Impact of CpG Methylation in DNA*”, *Biochemistry*, **2000**, 39, 4939-4946.

Hatcher, M.E., Mattiello, D.L., Meints, G. A., Orban, J.O., and Drobny, G.P. “*A Solid-State Deuterium NMR Study of the Localized Dynamics at the C9pG10 Step in the DNA Dodecamer [d(CGCGAATTCGCG)]₂*” *J. Amer. Chem. Soc.* **1998**, 120, 9850-9862.

Rienstra, C.M., Hatcher, M.E., Mueller, L.J., Sun, B.Q., Herzfeld, J., and Griffin, R.G. “*Efficient Multispin Homonuclear Double Quantum Recoupling for Magic-Angle Spinning NMR: ¹³C-¹³C Correlation Spectroscopy of u-¹³C-Erythromycin A*”, *J. Amer. Chem. Soc.* **1998**, 120, 10602-10612.

Hu, J. G., Sun, B. Q., Bizounok, M., Hatcher, M. E., Lansing, J. C., Raap, J., Verdegem, P.J.E., Lugtenburg, J., Griffin, R. G., and Herzfeld, J. “*Early and Late Intermediates in the Bacteriorhodopsin Photocycle: A Solid-State NMR Study*” *Biochem.* **1998** 37, 8088-8096.

Mehta, M.A., Gregory, D.M., S. Kiihne, Mitchell, D.J., Hatcher, M.E., Shiels, J.C., and Drobny, G.P. “*Distance Measurements in Nucleic Acids Using Windowless Dipolar Recoupling*”, *Solid State Nuc. Magn. Reson.*, **1996** 7, 221-228.

Hatcher, M.E. and Plachy, W.Z. “*Dioxygen Diffusion in the Stratum Corneum: An EPR Spin Label Study*”, *Biochem. Biophys. Acta* **1993** 1149, 73-78.

PRESENTATIONS

Invited Talks

252nd Annual American Chemical Society National Meeting, San Francisco CA, February 2017
Title: “Investigating Trends in DNA Backbone Structure and Dynamics for Ideal Drug Binding: A ³¹P NMR Study of the CRE Sequence”, **Graham Spurzem** (CMC 2018) and Mary Hatcher-Skeers

Southern California Conference on Undergraduate Research (SCCUR), Claremont CA
November, 2014

Title: “Difficulties with Diastereomers - The effect of a chiral phosphorothioate on the backbone conformations and dynamics of DNA: A preliminary study of the Cre Sequence”, **Sabrina Werby**, **Mabel Kyinn** and Mary Hatcher-Skeers

251st Annual American Chemical Society National Meeting, San Diego CA, March 2016
Title: “Differentiated introductory chemistry courses for enhanced retention”

59th Annual Biophysical Society Meeting, Baltimore, MD, February 2015

Title: "Correlating Drug Binding Affinities to Local DNA Dynamics"

California State University at Sonoma, Spring 2013

Seminar Title: "Dynamic DNA, Not Just a Double Helix Anymore",

Scripps College Convocation, "Ode to My Single Mother", Fall 2012

56th Annual Biophysical Society Meeting, San Diego CA, February 2012

Title: "Biophysics 101, National Lecture: Using NMR to Understand Biomolecules"

Southern California Users of Magnets Annual Meeting, Fall 2012, "The Sequence Context and Methylation Dependence of DNA Drug Binding", **Alexandra Pincus** and Mary E. Hatcher-Skeers

University of San Diego, Fall 2010

Seminar Title: "Biophysical Studies of DNA Conformation and Dynamics"

49th Experimental Nuclear Magnetic Resonance Conference, Asilomar CA, March 2008

Title: "³¹P NMR Investigation of Backbone Dynamics in DNA Binding Sites"

Schurr Symposium, University of Washington, Fall 2007

Seminar Title: "Investigating the Effects of Flanking Sequences on the Structure and Dynamics of DNA Backbones"

Joint Science Department, The Claremont Colleges, Spring 2007

Seminar Title: "A Biophysicist's View of CpG Methylation"

California State University at Northridge, Fall 2006

Seminar Title: "A Biophysicist's View of CpG Methylation",

Western Washington University, Bellingham WA, Spring 2004

Seminar Title: "Structure and Dynamics in DNA Binding Sites"

Marion Miner Cook Atheneum, Claremont McKenna College, Fall 2003

Seminar Title: "DNA: What We Know and Where We Are Going"

Scripps College Noon Academy, Spring 2003

Seminar Title: "Celebrating 50 Years of DNA"

Southern California Users of Magnets Meeting, Fall 2002

Seminar Title: "Understanding DNA Dynamics Using NMR"

University of Arizona, Biochemistry and Molecular Biophysics Department Seminar Series, Fall 2002

Seminar Title: "Understanding DNA Dynamics"

Claremont Colleges, W. M. Keck Faculty Speaker Series, Spring 2002

Seminar Title: "NMR Studies of the Structure and Dynamics of DNA Binding Sites"

Claremont McKenna College's Alumni College, Fall 2001

Seminar Title: "The Role of DNA Dynamics in Protein-DNA Recognition Events"

The FASEB Meeting on Biological Methylation, June 2001

Seminar Title: "The Dynamic Impact of CpG Methylation"

University of San Diego, Spring 2001

Seminar Title: "The Role of DNA Dynamics in Protein-DNA Complexes"

Beckman Institute at the City of Hope, Fall 2000

Seminar Title: "NMR Studies of the Dynamic Impact of CpG Methylation"

The Webb Schools Unbounded Thinkers Day, Spring 2000

Hatcher, M.E. "The Dynamics of a DNA Binding Site"

Physical Chemistry Seminar, UC Riverside, Fall 1999

Hatcher, M. E. "Solid-State Deuterium NMR Studies of DNA Dynamics"

Chemistry Seminar, San Francisco State University, Fall 1999

Seminar Title: "The Role of DNA Structure and Dynamics in Protein-DNA Recognition"

Magnetic Resonance Seminar, Massachusetts Institute of Technology, Spring 1996

Seminar Title: "A Deuterium NMR Comparison of DNA Dynamics in an Amorphous Powder and a Crystal"

Biophysics Seminar, University of Washington, Spring 1995

Seminar Title: "A Deuterium NMR Study of Local Dynamics in DNA"

American Chemical Society Meeting: Division of Chemical Education, 1994

Seminar Title: "A Model for Group Work"

Posters

252nd Annual American Chemical Society National Meeting, San Francisco CA, February 2017

"Biophysical investigation of DNA local structure", **Leonida Radford**, **Ifunanya Okeke**, and Mary Hatcher-Skeers

58th Annual Biophysical Society Meeting, San Francisco CA February **2014**

"A Combined NMR and Molecular Dynamics Investigation of Sequence Context Effects on Backbone Dynamics of DNA", **Kiley Lawrence** and Mary Hatcher-Skeers

57th Annual Biophysical Society Meeting, Philadelphia, PA February **2013** "Dynamic NMR Studies

Provide Insight Into Sequence Dependent Binding Affinities", **Claire Mazahery**, **Alexandra Pincus** and Mary Hatcher-Skeers

56th Annual Biophysical Society Meeting, San Diego CA, February, **2012** "The Sequence Context

and Methylation Dependence of DNA Drug Binding", **Alexandra Pincus** and Mary E. Hatcher-Skeers

241st American Chemical Society Meeting, Anaheim CA March, **2011** "Binding Affinity of the Cre

Binding Site with Varying Flanking Sequences upon Methylation", **Naomi Yonis**, **Dianna Buckett**, **Stephanie McCarty**, Mary Hatcher-Skeers

241st American Chemical Society Meeting, Anaheim CA March, **2011** "Using Fourier transform

infrared spectroscopy to explore the BI/BIII character of DNA dodecamers", **Janista Lek**, **Kimberly Fong** and Mary Hatcher-Skeers

54th Annual Biophysical Society Meeting, San Francisco CA, March **2010** "Spectroscopic Binding

Studies on the Structure and Binding Affinity of the *Cre* Sequence", **Dianna Buckett**, **Stephanie McCarty**, Ye Tian, Leonard Mueller and Mary Hatcher-Skeers

50th Experimental Nuclear Magnetic Resonance Conference, Asilomar CA, March **2009**

"³¹P NMR Investigation of Flanking Sequence and Methylation Effects on Drug Binding in DNA Binding Sites", **McCarty, S.**, Tian, Y., Mueller, L.J., and Mary E. Hatcher

53rd Annual Biophysical Society Meeting, Boston MA, February **2009** "Combined FTIR and NMR

Investigation of Covalently Modified DNA Binding Sequences", **Sarah Primrose**, **Kelly Miller** and Mary E. Hatcher

ICMRBS, San Diego CA, August **2008** "The Effect of Flanking Sequences on DNA Dynamics: A

³¹P NMR Study", **Kelly Miller**, Yi Tian, Leonard J. Mueller, and Mary E. Hatcher.

52nd Annual Biophysical Society Meeting, Long Beach CA, February **2008** "Investigating the

Effects of Flanking Sequences on the Structure and Dynamics of DNA", **Talia Khan**, Yi Tian,

Kelly Miller, Alejandro Gonzalez, Michael Kayatta, Patrick Mitchell, Katharine Shultis, Corrina Wood, Leonard J. Mueller and Mary E. Hatcher

51st Annual Biophysical Society Meeting, Baltimore, MD, February **2007** "A Biophysical Investigation of CpG Methylation Effects on DNA Dynamics", **Alejandro Gonzalez, A., Kayatta, M., Khan, T., Mitchell, P., Shultis, K., Wood, C.** and Hatcher, M.E.

50th Annual Biophysical Society Meeting, Salt Lake City, UT, February **2006** "A Biophysical Investigation into Dynamics Quenching Caused by DNA Methylation", **Shott, M., Shultis, K.,** Tian, Y., Lai, J., Mueller, L. and Hatcher, M.E.

229th American Chemical Society National Meeting, San Diego, CA, March **2005** "Rotational Barrier in Substituted Pyridine Carboxamides", **Pederson, K.,** Leskowitz, G., Olsen, R.A., Mueller, L., and Hatcher, M.E.

229th American Chemical Society National Meeting, San Diego, CA, March **2005** "Investigating the effects of multi-amine salts on genetic transformation efficiency", **Sutton, N.,** Zanella, A. and Hatcher, M.E.

49th Annual Biophysical Society Meeting, Long Beach, CA, February **2005** "31P-Dynamic NMR Studies of DNA Backbone Dynamics", **Levitan, R.,** Olsen, R., Leskowitz, G, Mueller, L., and Hatcher, M. E.

226th American Chemical Society Meeting, New Orleans, LA, March **2003** "Determination of a Method for Analyzing MTBE in a Salt Water Matrix", **Fliegler, J.** and Hatcher, M.E.

44th Experimental Nuclear Magnetic Resonance Conference, Savannah, GA, March **2003** "Comparison of the Structure and Dynamics of the BamHI DNA Recognition Sequence to those of a Noncognate Sequence by Solution State ¹H NMR", **Bean, C.** and Hatcher, M.E.

46th Annual Biophysical Society Meeting, San Francisco, CA, February **2002** "NMR Studies of the Structure and Dynamics of DNA Binding Sites" **Cano, K.,** Chen, Y. and Hatcher, M.

221st American Chemical Society National Meeting, San Diego, CA, Spring **2001** "Studies of Genetic Transformation Efficiency Using Various Cobalt Compounds to make Competent Cells", **Dietrich, A.,** Zanella, A., and Hatcher, M. E.

41st Experimental Nuclear Magnetic Resonance Conference, Pacific Grove, CA, Spring **2000** "Probing Dynamics in DNA Binding Sequences" **Cano, K.,** Chen, Y.,and Hatcher, M. E.,

41st Experimental Nuclear Magnetic Resonance Conference, Pacific Grove, CA, Spring **2000** "A Solid-State Deuterium NMR Study of the M. Hhal Binding Site: The Role of Internal DNA Dynamics on Base-Flipping", Meints, G.M., Geahigan, K.B., Hatcher, M.E., and Drobny, G.P.

The Fourth Annual Maria Goeppert-Mayer Symposium, UC San Diego, Spring **1999** "NMR Study of DNA Dynamics in the EcoRI-DNA Complex", **Rapu, J., Mols, J.,** and Hatcher, M.E.

42nd Annual Biophysical Society Meeting, **1998** "A Solid-State NMR Investigation of the Schiff Base Linkage in a Mutant of Bacteriorhodopsin", Hatcher, M. E., Hu, J.G., Bizounok, M., Griffin, R. G. and Herzfeld, J.

42nd Annual Biophysical Society Meeting, **1998** "Early and Late Intermediates in the Bacteriorhodopsin Photocycle: A Solid-State NMR Study" Hu, J. G., Sun, B. Q., Bizounok, M.,Hatcher, M. E., Lansing, J. C., Raap, J., Verdegem, P.J.E., Lugtenburg, J., Griffin, R. G., and Herzfeld, J.

39th Experimental Nuclear Magnetic Resonance Conference, **1998** "Two-Dimensional Correlation

Spectroscopy in a Membrane Protein", Hatcher, M. E., Hu, J. G., Rienstra, C. M., Sun, B. Q., Lansing, J. C., Herzfeld, J. and Griffin, R. G.

Gordon Research Conference on Magnetic Resonance, **1995** "A Deuterium NMR Investigation of the Furanose Dynamics in the EcoRI Binding Site", Hatcher, M.E., Mattiello, D., Zhu, L., Shiels, J. and Drobny, G.

39th Annual Biophysical Society Meeting, **1995** "A Solid State NMR Study of Sugar Rings in an Oligonucleotide", Hatcher, M..E. and Drobny, G. P.

Rocky Mountain Conference, **1992** "Dioxygen Diffusion in the Stratum Corneum: an EPR Spin Label Study", Hatcher, M.E. and Plachy, W.Z.

Gordon Research Conference on the Barrier Function of the Skin, **1991**. "Oxygen Diffusion and the Effect of Permeation Enhancers in the Stratum Corneum", Hatcher, M.E., Rehfeld, S.J., and Plachy, W.Z.

Student research projects directed in last five years

Academic Year 2012-2013:

Catie Edmunds (Scripps) – senior thesis

Claire Mazahery (Scripps)– senior thesis

Esmeralda Trejo (CMC) – senior thesis Faith Heffernan (Scripps) – senior thesis

Mackenzie Rouff (CMC) – senior thesis

Summer 2013:

Kiley Lawrence (Scripps)

Maria Ceja Rodriguez (Scripps)

Academic Year 2013-2014:

Kiley Lawrence (Scripps) – senior thesis

Marie Ceja Rodriguez (Scripps) – senior thesis

Mary Creedon (Scripps) – senior thesis

Amy Hershberger (Pitzer) – senior thesis

Academic Year 2014-2015:

Danial Ceasar (CMC) – senior thesis

Faye Jones (CMC) – senior thesis

Summer 2015:

Sabrina Werby (Pitzer)

Mabel Kyinn (Scripps)

Academic Year 2015-2016:

Sabrina Werby (Pitzer) – Senior thesis

Mabel Kyinn (Scripps) – Senior thesis

Theresa Weschler (Scripps) – Independent study

Ifuenela Okeke (Scripps) – Independent study

Summer 2016:

Leonida Radford (Scripps)

Ifunenela Okeke (Scripps)

Graham Spurzem (CLC)

Academic Year 2016-2017:

Graham Spurzem (CMC) – Senior thesis

Leonida Radford (Scripps) – Senior thesis

Brynne Ichiuji (Scripps) – Senior thesis

Amy Johnson (CMC) – Senior thesis

Claire Conklin (Pitzer) – Senior thesis

Academic Year 2017-2018:

Marly Coe (Scripps) –Senior thesis

Mariah Mastrodimos (Scripps) – Senior thesis