

DINA C. MERRER

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Education

5/99 Ph.D., Organic Chemistry, Rutgers University, New Brunswick, NJ
Absolute Kinetics of Selected Singlet Carbenes: Rearrangement in Excited States, Quantum Mechanical Tunneling, and Bystander Effects

5/94 B.A., Chemistry (*magna cum laude*, Phi Beta Kappa), Smith College, Northampton, MA
Modifications of Tin Oxide Semiconductor Electrodes with Functionalized Porphyrins

Academic and Research Experience

8/01-present **Assistant Professor of Chemistry**, Department of Chemistry, Barnard College, Columbia University, New York, NY

7/99-7/01 **OSU Postdoctoral Fellow**, Department of Chemistry, The Ohio State University, Columbus, OH
Advisor: Professor Matthew S. Platz
Measured the fast kinetics of novel triplet carbenes by nanosecond laser flash photolysis and time-resolved infrared spectroscopies, cryogenic matrix techniques, and ab initio computational methods; synthesized bifunctional molecules for use as covalent links between polymeric layers in organic light-emitting diodes.

9/94-5/99 **Graduate Research Fellow**, Department of Chemistry, Rutgers University, New Brunswick, NJ
Advisor: Professor Robert A. Moss
Synthesized benzyl and alkylhalodiazirines and acetoxydiazirines; photochemically generated carbenes and studied their fast kinetics by laser flash photolysis; determined absolute rates and Arrhenius parameters for intramolecular and intermolecular carbenic reactions by laser flash photolysis.

5/93-5/94 **Undergraduate Research Assistant**, Department of Chemistry, Smith College, Northampton, MA
Advisor: Professor Sharon M. Palmer
Synthesized and studied electrochemistry of functionalized porphyrins; derivatized semiconductor electrodes with porphyrins by organic coupling techniques.

Fellowships and Awards

2006	Gladys Brooks Teaching Award, Barnard College
1999-2000	Ohio State University Postdoctoral Fellowship
1997-1998	Department of Education GAANN Graduate Fellowship
1996	William Rieman Teaching Prize, Rutgers University
1994-1996	Excellence Graduate Fellowship, Rutgers University
1995	J.R.L. Morgan Scholarship, Rutgers University
1995	U.S. Department of Defense Graduate Fellowship, Honorable Mention
1994	Phi Beta Kappa
1994	Sigma Xi Scientific Research Honor Society

Professional Affiliations

American Chemical Society
Council on Undergraduate Research
Phi Beta Kappa
Sigma Xi

Research Grants

9/05-8/08	National Science Foundation, CHE-0517876, \$201,000 Mechanisms of Electrophilic Carbene Additions to Strained Cyclic C-C Bonds
3/03-3/06	National Science Foundation, CHE-0234660, \$90,049 A High Resolution GC/MS/FID for Undergraduate Research in Chemistry
6/02-6/04	Cottrell College Science Award, Research Corporation, CC5551, \$35,000 Relative and Absolute Kinetic Studies of Stable Nucleophilic Carbenes
5/02-8/04	Petroleum Research Fund, American Chemical Society, 37969-GB4, \$35,000 Mechanisms of Intramolecular Ring Expansions: Additions of Carbenes to Strained Cyclic Systems
5/02-5/03	National Center for Supercomputing Applications, 10,000 cpu hours Mechanisms of Carbene Additions to Strained Cyclic Systems
6/02-8/02	New York Science Education Program Summer Undergraduate Fellowship to Alexis N. Sabo (BC '03), \$4,000 The Mechanism of Electrophilic Carbene Addition to Benzocyclopropene: Concerted or Stepwise?

Publications (undergraduate co-workers underlined)

- (11) Bernard, S. E.; Merrer, D. C. Mechanisms of Halocarbene Additions to Cyclooctyne: A Computational Investigation, in preparation.
- (10) Khrapunovich, M.; Zelenova, E.; Seu, L.; Sabo, A. N.; Flaherty, A.; Merrer, D. C. Regioselectivity and Mechanism of Dihalocarbene Addition to Benzocyclopropene, in preparation.

- (9) Merrer, D. C.; Rablen, P. R. Dichlorocarbene Addition to Cyclopropenes: A Computational Study, *J. Org. Chem.* **2005**, *70*, 1630-1635.
- (8) Merrer, D. C.; Ozcetinkaya, S.; Shinnar, A. E. Experimental and Theoretical Ultraviolet Spectra of Haloindoles, *Tetrahedron Lett.* **2004**, *45*, 4899-4902.
- (7) Merrer, D. C.; Moss, R. A. Kinetics of Intramolecular Carbene Rearrangements, in *Advances in Carbene Chemistry*; Brinker, U. H., ed.; JAI Press: Greenwich, CT, 2001, Vol. 3, pp 53-113.
- (6) Moss, R. A.; Johnson, L. A.; Merrer, D. C.; Lee, G. E. Jr. Carbenes as Substrates: Bimolecular Fragmentation of Alkoxychlorocarbenes, *J. Am. Chem. Soc.* **1999**, *121*, 5940-5944.
- (5) Moss, R. A.; Merrer, D. C. Structure-Reactivity Dependence in the Rearrangements of a Family of Alkylacetoxycarbenes, *Tetrahedron Lett.* **1998**, *39*, 8067-8070.
- (4) Merrer, D. C.; Moss, R. A.; Liu, M. T. H.; Banks, J. T.; Ingold, K. U. Benzylchlorocarbene: Origins of Arrhenius Curvature in the Kinetics of the 1,2-H Shift Rearrangement, *J. Org. Chem.* **1998**, *63*, 3010-3016.
- (3) Moss, R. A.; Maksimovic, L.; Merrer, D. C. Benzylfluorocarbene: Reactions and Kinetics, *Tetrahedron Lett.* **1997**, 7049-7052.
- (2) Moss, R. A.; Merrer, D. C. Absolute Kinetics of Mesitylmethylchlorocarbene Reactions, *J. Chem. Soc., Chem. Commun.* **1997**, 617-618.
- (1) Moss, R. A.; Ma, W.; Merrer, D. C.; Xue, S. Conversion of 'Obstinate' Nitriles by Garigipati's Reaction, *Tetrahedron Lett.* **1995**, 8761-8764.

Presentations (undergraduate co-workers underlined)

- (11) Bernard, S. E.; Napolitano, D. C.; Suski, K.; Khrapunovich, M.; Merrer, D. C. Mechanisms of Halocarbene Additions to Cyclooctyne: An Experimental and Theoretical Investigation, 233rd National Meeting of the American Chemical Society, Chicago, IL, March 2007.
- (10) Bernard, S. E.; Merrer, D. C. Computational Study of Chlorocarbene Addition to Cyclooctyne, Mercury Conference on Computational Chemistry, Clinton, NY, July 2006.
- (9) Khrapunovich, M.; Zelenova, E.; Flaherty, A.; Seu, L.; Sabo, A. N.; Merrer, D. C. Regioselectivity and Mechanism of :CX₂ Addition to Benzocyclopropene, Reaction Mechanisms Conference, College Park, MD, June 2006.
- (8) Nicolas, C. I.; Merrer, D. C.; Addition of Dihalocarbenes to Benzyl[1.1.1]propellane, 231st National Meeting of the American Chemical Society, Division of Organic Chemistry, Atlanta, GA, March 2006.
- (7) Merrer, D. C.; Doubleday, C. E., Jr. Dynamics of Carbene Addition to Cyclopropene, 2005 International Chemical Congress of Pacific Basin Societies (Pacifichem), Honolulu, HI, December 2005.
- (6) Khrapunovich, M.; Zelenova, E.; Flaherty, A.; Seu, L.; Sabo, A. N.; Merrer, D. C. Regioselectivity and Mechanism of :CX₂ Addition to Benzocyclopropene, 2005 Gordon Conference on Physical Organic Chemistry, Plymouth, NH, June 2005.
- (5) Merrer, D. C.; Zelenova, E.; Khrapunovich, M.; Huang, D.; Seu, L.; Sabo, A. N. Singlet Carbene Additions to Strained Benzannulated Rings, 227th National Meeting of the American Chemical Society, Division of Organic Chemistry, Anaheim, CA, March 2004.
- (4) Zelenova, E.; Merrer, D. C.; Addition of Singlet Carbenes to Benzocyclopropene, 225th National Meeting of the American Chemical Society, Division of Organic Chemistry, New Orleans, LA, March 2003.

- (3) Merrer, D. C. Dichlorocarbene Addition to Cyclopropenes: A Computational Study, 225th National Meeting of the American Chemical Society, Division of Organic Chemistry, New Orleans, LA, March 2003.
- (2) Merrer, D. C.; Flaherty, A. Theoretical Study of Dichlorocarbene Addition to Cyclopropenes, Reaction Mechanisms Conference, Columbus, OH, July 2002.
- (1) Merrer, D. C.; Moss, R. A. Bystander Effects in Related Acetoxycarbenes, 216th National Meeting of the American Chemical Society, Division of Organic Chemistry, Boston, MA, August 1998.

Invited Lectures

- (13) Mechanisms of Carbene Addition to Cyclopropenes: Dynamics and Strain, Brooklyn College, Brooklyn, NY, May 2007.
- (12) Mechanisms of Carbene Addition to Cyclopropenes: Dynamics and Strain, Rutgers University, New Brunswick, NJ, May 2007.
- (11) Dynamics in the Mechanisms of Carbene Additions to Strained C-C Bonds, 233rd National Meeting of the American Chemical Society, Chicago, IL, March 2007.
- (10) Carbenes Behaving Dynamically: Additions to Cyclopropenes, Colby College, Waterford, ME, February 2007.
- (9) Mechanisms of Carbene Addition to Cyclopropenes: Dynamics and Strain, University of Maryland, College Park, MD, October 2006.
- (8) Mechanisms of Carbene Addition to Cyclopropenes: Dynamics and Strain, Johns Hopkins University, Baltimore, MD, October 2006.
- (7) Regioselectivity and Mechanism of $:CX_2$ Addition to Benzocyclopropene, Reaction Mechanisms Conference, College Park, MD, June 2006.
- (6) Chemistry + Carbenes = Career, General Electric Fellowship Program for minority students in the sciences, Barnard College, New York, NY, April 2006.
- (5) Mechanisms of Carbene Additions to Cyclopropenes: Dynamics and Strain, Columbia University, New York, NY, March 2006.
- (4) Carbene Addition to Cyclopropenes: Mechanistic Reconsiderations, Long Island University, Brooklyn, NY, October 2005.
- (3) Carbenes Behaving Dynamically: Addition to Cyclopropene, Smith College, Northampton, MA, April 2005.
- (2) Carbenes Behaving Dynamically, Organic Chemistry Celebration, Barnard College, New York, NY, February 2005.
- (1) A Mechanistic Mystery: Carbene Addition to Cyclopropenes, Western Connecticut State University, Danbury, CT, April 2003.

Research Students

Sarah Bernard (Barnard '07, senior thesis/summer research)

Sarah received a Bernice Segal research fellowship for her senior honors thesis research in Summer 2006 and continued through 2006-07. Sarah presented her project, "A Computational Investigation of Chlorocarbene Additions to Cyclooctyne," at the Mercury Conference on Computational Chemistry at Hamilton College in July 2006, and co-presented our work at the 233rd National Meeting of the American Chemical Society in Chicago in March 2007, with financial support from Barnard College. She will begin the Ph.D. program in Chemistry at Boston University in Fall 2007.

Presentations: Computational Study of Chlorocarbene Addition to Cyclooctyne
Mercury Conference on Computational Chemistry, Clinton, NY, July 2006.

Mechanisms of Halocarbene Additions to Cyclooctyne: An Experimental and Computational Investigation
233rd National Meeting of the American Chemical Society, Chicago, IL, March 2007.

Aidan Flaherty (Barnard '04, independent study)

Aidan, an Architecture major, performed computational studies on substituted benzocyclopropenes in my laboratory when she was a sophomore, during my first year at Barnard. She also was a great help to me in setting up my lab in Fall 2001.

Rebecca Goldstein (Barnard '07, guided research)

Rebecca was a Biochemistry major advisee who conducted research on the synthesis of *trans*-bicyclo[6.1.0]nonane during Fall 2005.

Diana Huang (Barnard '05, summer research/guided research)

The Bernice Segal Fund and Research Corporation supported Diana's research in my laboratory during Summers 2003 and 2004, respectively. She co-presented our research at the 227th National Meeting of the American Chemical Society in Anaheim in March 2004. Diana began medical school at SUNY-Buffalo in Fall 2005.

Presentation: Singlet Carbene Additions to Strained Benzannelated Rings
227th National Meeting of the American Chemical Society, Anaheim, CA, March 2004.

Karen Justiniano (Barnard '08, guided research)

Karen is a Biochemistry major advisee who conducted research on the synthesis of 1-methyl-*trans*-[6.1.0]bicyclononane during Fall 2006.

Marina Khrapunovich (Barnard '06, senior thesis/summer research/guided research)

A Biochemistry major, Marina was awarded the 2003-04 Award for Excellence in Organic Chemistry, the 2004-05 Marie Riemer Prize for best junior major, and the 2005-06 American Chemical Institute Award to the top graduating Chemistry or Biochemistry major from the Barnard Chemistry Department. In addition, she has received several Barnard College awards, including the 2006 Alpha-Zeta Prize for a graduating senior pursuing a career in the professions.

Marina was a continuous member of my research group June 2003-May 2006, her work culminating with her senior thesis on "Mechanisms of Singlet Carbene Addition to *trans*-Bicyclo[6.1.0]nonane and to Cyclooctyne." Her research has been supported by an award from the Bernice Segal Fund, Research Corporation, and the Petroleum Research Fund (PRF) of the American Chemical Society. Marina co-presented our research at the 227th National Meeting of the American Chemical Society in Anaheim in March 2004. She began the M.D./Ph.D. program at Albert Einstein College of Medicine in Summer 2006.

Presentation: Singlet Carbene Additions to Strained Benzannelated Rings

227th National Meeting of the American Chemical Society, Anaheim, CA, March 2004.

Denise Napolitano (Barnard '08, summer research/guided research)

Denise has been a continuous member of my research group since June 2005. During this time, she has been supported by funds from the PRF and NSF, and was a Howard Hughes Research Intern in 2006-07. Denise has investigated the synthesis of substituted derivatives of [1.1.1]propellane in Summer 2005, and has more recently (Summer 2006 to present) researched the mechanisms of phenylhalo- and dihalocarbenes with cyclooctyne. Denise co-presented our research at the 233rd National Meeting of the American Chemical Society in Chicago in March 2007. She will continue in my lab in Summer 2007 through 2007-08 as a senior honors thesis student.

Presentation: Mechanisms of Halocarbene Additions to Cyclooctyne: An Experimental and Computational Investigation
233rd National Meeting of the American Chemical Society, Chicago, IL, March 2007.
Howard Hughes Science Pipeline Symposium, Barnard College, New York, NY, April 2007.

Chantel Nicolas (Barnard '07, summer research/guided research)

Chantel worked in my group continuously June 2005-December 2006, with support from Research Corporation and NSF. She completed three semesters of independent study in 2005-06 and Fall 2006, and presented our research on the synthesis of benzyl[1.1.1]propellane at the 227th National Meeting of the American Chemical Society in Atlanta in March 2006.

Presentation: Addition of Dihalocarbenes to Benzyl[1.1.1]propellane
231st National Meeting of the American Chemical Society, Atlanta, GA, March 2006.

Annice Ormiston (Barnard '05, guided research)

A Psychology major, Annice spent Spring 2003 working on the benzocyclopropene project.

Sonia Ortiz (Barnard '08, summer research)

Sonia conducted research in my group in Summer 2006 on the synthesis of 1-methyl-*trans*-[6.1.0]bicyclononane. She will continue working on this project, expanding it to the investigation of carbene additions to this strained substrate in Summer 2007 and as a senior honors thesis in 2007-08. Sonia's research has been supported by NSF.

Alexis Sabo (Barnard '03, summer research)

Alexis worked in my laboratory in Summer 2002 with stipend support from the New York Science Education Project. A graduate in Chemistry, Alexis is a Franciscan sister of the Catholic Church living in and serving the Bronx.

Lillian Seu (Barnard '05, guided research)

In Summer 2003, Lillian was accepted into the NSF-sponsored chemistry and information technology program – a collaboration between involving San Jose State University and

IBM. She received a Travel Award for Undergraduate Students in Organic Chemistry to co-present our research at the 227th National Meeting of the ACS in Anaheim in March 2004. Only four such awards, sponsored by the Division of Organic Chemistry of the ACS, were made nationwide. She spent Summer 2004 as an REU student in the Dept. of Pharmacology at UCSF, and conducted senior thesis research with Dr. Geoffrey Pitt at Columbia Med, continuing this work in 2005-06. Lillian began a Ph.D. program in Pharmacology at UCSF in Fall 2006.

Presentations: Singlet Carbene Additions to Strained Benzannelated Rings
227th National Meeting of the American Chemical Society, Anaheim, CA, March 2004.

Kaitlyn Suski (Barnard '08, summer research)

Kaitlyn spent Summer 2006 investigating the reactions of halocarbenes with cyclooctyne. She will continue working on this project in Summer 2007 and as a senior honors thesis in 2007-08. Kaitlyn's research has been supported by NSF.

Ilana Vinograd (Barnard '05, guided research)

Ilana joined my research group in January 2004, to work on the benzocyclopropene project. She majored in Psychology and plans to attend medical school.

Ekaterina Zelenova (Barnard '03, senior thesis/guided research)

Ekaterina (Kate) received a Howard Hughes Science Pipeline Research fellowship for her senior thesis research in June 2002-May 2003. She received a travel award from the Women's Chemists Committee of the ACS for travel to the 225th National Meeting of the ACS in New Orleans in March 2003, where she presented our research in the Division of Organic Chemistry. Fourteen awards were made nationwide, with only four going to undergraduates. Kate also received financial support for this conference presentation from the Hughes Foundation and Barnard College. A Chemistry alumna, she spent two years as a research associate in Biochemistry at the Rockefeller University. Kate started a Ph.D. program in Molecular Biology at UC-Berkeley in Fall 2005.

Presentations: Addition of Singlet Carbenes to Benzocyclopropene
225th National Meeting of the American Chemical Society, New Orleans, LA, March 2003.
Howard Hughes Science Pipeline Symposium, Barnard College, New York, NY, April 2003.
51st Annual Undergraduate Research Symposium, New York Section of the American Chemical Society, Long Island University, Brooklyn, NY, May 2003.

Courses taught

Fall 2001 CHEM BC 3231 Organic Chemistry II
Guided research student: Aidan Flaherty

Spring 2002 CHEM BC 3368 Physical Chemistry II Laboratory
Guided research students: Aidan Flaherty, Ekaterina Zelenova

Fall 2002 CHEM BC 3231 Organic Chemistry II

	Senior thesis student: Ekaterina Zelenova
<i>Spring 2003</i>	CHEM BC 3230 Organic Chemistry I Senior thesis student: Ekaterina Zelenova Guided research student: Annice Ormiston
<i>Fall 2003</i>	CHEM BC 3231 Organic Chemistry II Guided research students: Diana Huang, Marina Khrapunovich, Lillian Seu
<i>Spring 2004</i>	CHEM BC 3230 Organic Chemistry I CHEM BC 3280 Advanced Organic Chemistry (new course introduced with Christian Rojas) Guided research students: Diana Huang, Marina Khrapunovich, Lillian Seu, Ilana Vinograd
<i>Fall 2004- Spring 2005</i>	On Special Assistant Professor Leave
<i>Fall 2005</i>	CHEM BC 3333/3335 Modern Techniques of Organic Chemistry Laboratory Senior thesis student: Marina Khrapunovich Guided research students: Rebecca Goldstein, Chantel Nicolas
<i>Spring 2006</i>	CHEM BC 3232 Intermediate General Chemistry CHEM BC 3280 Advanced Organic Chemistry (with Christian Rojas) Senior thesis student: Marina Khrapunovich Guided research student: Chantel Nicolas
<i>Fall 2006</i>	CHEM BC 3333/3335 Modern Techniques of Organic Chemistry Laboratory Senior thesis student: Sarah Bernard Guided research students: Karen Justiniano, Denise Napolitano, Chantel Nicolas
<i>Spring 2007</i>	Teaching release – 2 units Senior thesis student: Sarah Bernard Guided research student: Denise Napolitano

Service

Barnard College contributions

<i>2005-present</i>	Board of Trustees Committee on Student Life
<i>2005-present</i>	Student Life Committee
<i>2005-present</i>	Committee on Honors
<i>2002-present</i>	Chemistry Department faculty search committees – 7 total
<i>2002-present</i>	Premajor and major adviser
<i>2003-2004</i>	Committee on Instruction
<i>2002-2004</i>	Committee on Programs and Academic Standing
<i>5/03</i>	Faculty representative for Five Sisters admissions recruiting events in NYC and Chicago
<i>Fall 2002, 2003</i>	Participant in SGA town hall meetings: diversity on campus

honor code

2001-2002 Faculty teller for faculty elections
 11/02 Arranged for and hosted departmental seminar speaker
 4/02 Panelist: "What is graduate school like?" for Barnard undergraduates

Columbia University contributions

10/06 Coordinated Columbia organic chemistry problem session
 3/06 Presented research seminar at Columbia organic chemistry problem session
 4/03 Coordinated Columbia organic chemistry problem session
 2001-present Columbia Chemistry Ph.D. thesis examination committees – 9 students to date
 2001-present Participant in weekly Columbia organic chemistry seminars and problem sessions

Other professional contributions

2005-present Article reviewer: *Journal of Organic Chemistry*
 2002-present Grant proposal reviewer: NSF, PRF
 4/06 Participant in Changing the Face of Science and Engineering Women in Science conference, Smith College, Northampton, MA
 11/05 Liberal arts college panelist for NSF-sponsored workshop for postdoctorals and graduate students on Academic Careers in Chemistry, Eastern Analytical Symposium, Somerset, NJ
 8/03 Participant in an NSF-sponsored summit about research at predominantly undergraduate institutions, Bates College, Lewiston, ME