

CURRICULUM VITAE
DR. JUSTIN S. MILLER

Associate Professor
Department of Chemistry
Hobart and William Smith Colleges
Geneva, NY 14456
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EDUCATION

Sloan-Kettering Institute for Cancer Research

Postdoctoral Fellow (2001 – 2004), Advisor: Dr. Samuel J. Danishefsky

Massachusetts Institute of Technology

Ph.D., Organic Chemistry (2001), Advisors: Dr. Daniel S. Kemp, Dr. Scott C. Virgil

- Dissertation: "I. Efforts towards the Synthesis of CP-263,114. II. On Solubilized, Spaced Polyalanines and Amino Acid α -Helix Propensities."
- Graduate Student Teaching Award (1998)

Princeton University

A.B., Chemistry (1995), Advisor: Dr. Jeffrey Schwartz

- Senior thesis: "The Reduction of Methyl Cinnamate by Titanocene Borohydride: A Mechanistic Study."

ACADEMIC APPOINTMENTS

Associate Professor, organic chemistry, Hobart and William Smith Colleges (HWS) (2010 – present;
Chair 2013 – present)

Assistant Professor, organic chemistry, Hobart and William Smith Colleges (HWS) (2004 – 2010)

Research interests

- Peptide and protein synthetic methodology
- Organic synthesis of bioactive molecules
- Principles of bioorganic chemistry

Courses taught

- Introductory and intermediate organic chemistry, including laboratory
- Bonding with Food: The Chemistry of Food Preparation, Production, and Policy
- Advanced organic chemistry
- Introductory general chemistry, including laboratory

EXTERNAL GRANT FUNDING

co-PI, NSF – Transforming Undergraduate Education in STEM (NSF-TUES) (2011 – 2014)

- (\$180,000) "NSF-TUES: Transforming Cell Biology and Organic Chemistry through Incorporation of the HDACi Cancer Therapeutic Laboratory Project"

PI, National Institutes of Health Academic Research Enhancement Award (NIH-AREA) (2010 – 2014)

- (\$355,523) "NIH-AREA: Synthesis of Anticancer HDAC Inhibitor Natural Products and Analogs"

PI, National Science Foundation Major Research Instrumentation (NSF-MRI) Award (2007 – 2010)

- (\$342,000) "MRI: Acquisition of an NMR Spectrometer to Advance Active Undergraduate Education and Research Programs"

Research Corporation Cottrell College Science Award (2005 – 2009)

- (\$40,218 + \$15,000 institutional matching) "Solid-Phase Synthesis of Cyclic, Cysteine-Containing Natural Products and Analogues"

Camille and Henry Dreyfus Start-up Award (2004 – 2009)

- (\$30,000) "Solid-Phase Synthesis of Peptide Bioconjugates and Peptidic Natural Products"

U.S. Army Prostate Cancer Research Postdoctoral Training Award (2003 – 2004)

- (\$98,000) "Toward a Diagnostic Immunoassay Specific for Prostate Cancer: Chemical Synthesis of Homogeneous *N*-Linked Prostate Specific Antigen Glycopeptides"

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PUBLICATIONS (undergraduate coauthors in **bold**)

- (13) **N. A. Calandra, Y. L. Cheng, K. A. Kocak**, and J. S. Miller. "Total Synthesis of Spiruchostatin A via Chemoselective Macrocyclization using an Accessible Enantiomerically Pure Latent Thioester." *Org. Lett.* **2009**, *11*(9), 1971-1974.
- (12) R. J. Moreau, C. R. Schubert, **K. A. Nasr, M. Török, J. S. Miller, R. J. Kennedy, and D. S. Kemp**. "Context-Independent, Temperature-Dependent Helical Propensities for Amino Acid Residues." *J. Am. Chem. Soc.* **2009**, *131*(36), 13107-13116.
- (11) V. Y. Dudkin, J. S. Miller, A. S. Dudkina, C. Antczak, D. A. Scheinberg, and S. J. Danishefsky. "Toward a Prostate Specific Antigen-Based Prostate Cancer Diagnostic Assay: Preparation of Keyhole Limpet Hemocyanin-Conjugated Normal and Transformed Prostate Specific Antigen Fragments." *J. Am. Chem. Soc.* **2008**, *130*(41), 13598-13607.
- (10) G. E. Job, R. J. Kennedy, Heitmann, B., J. S. Miller, S. M. Walker, and D. S. Kemp. "Temperature- and Length-Dependent Energetics of Formation for Polyalanine Helices in Water: Assignment of $w_{\text{Ala}}(n,T)$ and Temperature-Dependent CD Ellipticity Standards." *J. Am. Chem. Soc.* **2006**, *128*(25), 8227-8233.
- (9) J. D. Warren, J. S. Miller, S. J. Keding, and S. J. Danishefsky. "Toward Fully Synthetic Glycoproteins by Ultimately Convergent Routes: A Solution to a Long-Standing Problem." *J. Am. Chem. Soc.* **2004**, *126*, 6576-6578.
- (8) V. Y. Dudkin, J. S. Miller, and S. J. Danishefsky. "Chemical Synthesis of Normal and Transformed PSA Glycopeptides." *J. Am. Chem. Soc.* **2004**, *126*, 736-738.
- (7) J. S. Miller, V. Y. Dudkin, G. J. Lyon, T. W. Muir, and S. J. Danishefsky. "Toward Fully Synthetic N-Linked Glycoproteins." *Angew. Chem. Int. Ed.* **2003**, *42*(4), 431-434.
- (6) V. Y. Dudkin, J. S. Miller, and S. J. Danishefsky. "A Concise Route to the Core Pentasaccharide of N-Linked Glycoproteins." *Tetrahedron Lett.* **2003**, *44*(9), 1791-1793.
- (5) P. Wallimann, R. J. Kennedy, J. S. Miller, W. Shalongo, and D. S. Kemp. "Dual Wavelength Parametric Test of Two-State Models for Circular Dichroism Spectra of Helical Polypeptides: Anomalous Dichroic Properties of Alanine-Rich Peptides." *J. Am. Chem. Soc.* **2003**, *125*(5), 1203-1220.
- (4) J. S. Miller, R. J. Kennedy, and D. S. Kemp. "Solubilized, Spaced Polyalanines: A Context-Free System for Determining Amino Acid α -Helix Propensities." *J. Am. Chem. Soc.* **2002**, *124*(6), 945-962.
- (3) W. Maison, R. J. Kennedy, J. S. Miller, and D. S. Kemp. "C-Terminal Helix Capping Propensities in a Polyalanine Context for Amino Acids Bearing Nonpolar Aliphatic Side Chains." *Tetrahedron Lett.* **2001**, *42*(30), 4975-4977.
- (2) J. S. Miller, R. J. Kennedy, and D. S. Kemp. "Short, Solubilized Polyalanines Are Conformational Chameleons: Exceptionally Helical If N- and C-Capped with Helix Stabilizers, Weakly to Moderately Helical If Capped with Rigid Spacers." *Biochemistry*, **2001**, *40*(2), 305-309.
- (1) J. M. Schmitt, G. X. Zhou, and J. Miller. "Measurement of blood hematocrit by dual-wavelength near-IR photoplethysmography." *Proc. SPIE-Int. Soc. Opt. Eng.* **1992**, *1641* (Physiol. Monit. Early Detect. Diagn. Methods), 150-61.

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PATENTS

- (2) S. J. Danishefsky, V. Y. Dudkin, J. S. Miller, D. A. Scheinberg, and C. Antczak. "Preparation of normal and transformed PSA glycopeptide conjugates for diagnostic and therapeutic applications." *U.S. Pat. Appl. Publ.* **2006**, 124 pp. Patent application cont.-in-part of Appl. No. PCT/03US/38453.
- (1) S. J. Danishefsky, V. Y. Dudkin, and J. S. Miller. "Preparation of Prostate Specific Antigens and Conjugates of Diagnosis and Treatment of Cancer." *PCT Int. Appl.* **2004**, 257 pp. Patent application: WO 2003-US38453.

PRESENTATIONS (undergraduate coauthors in bold)

- (22) **G. B. Shelkey, W. S. Perkins, X. Zang, L. Peraro, S. L. Cramer, J. N. Garofalo, T. R. Blum**, and J. S. Miller. "Cyclic, cysteine-containing depsipeptide synthesis *via* latent thioester key intermediates." 43rd ACS National Organic Chemistry Symposium, Seattle, WA, Jun 23-27, **2013**.
- (21) W. J. Bowyer, J. S. Miller, and C. Forbes. "Kitchen as laboratory: Two courses at two very different levels." Abstracts of Papers, 245th ACS National Meeting, New Orleans, LA, Apr 7-11, **2013**, CHED-1704. (oral)
- (20) **L. Peraro** and J. S. Miller. "Incorporating original research into the organic teaching laboratory: The HDACi Cancer Therapeutic Laboratory Project." Abstracts of Papers, 245th ACS National Meeting, New Orleans, LA, Apr 7-11, **2013**, CHED-1614. (oral)
- (19) J. S. Miller and G. L. Sacks. "Chemistry of Cajun Cooking Competition." Abstracts of Papers, 245th ACS National Meeting, New Orleans, LA, Apr 7-11, **2013**, CHED-83.
- (18) **X. Zang, L. Peraro, H. K. Shah, G. B. Shelkey, M. A. Mahajan**, and J. S. Miller. "Solid-phase synthesis of depsipeptidic potential anticancer compounds using latent thioesters." Abstracts of Papers, 245th ACS National Meeting, New Orleans, LA, Apr 7-11, **2013**, ORGN-204.
- (17) **W. S. Perkins, X. Zang, L. Peraro, H. K. Shah, N. M. Zanghi**, and J. S. Miller. "Solid-Phase Synthesis of Depsipeptidic Anticancer Natural Products and Analogs *via* Improved Latent Thioester Mediated Solid-Phase Methodology." Abstracts of Papers, 243rd ACS National Meeting, San Diego, CA, Mar 25-29, **2012**, ORGN-610.
- (16) **D. M. Wholly, W. S. Perkins, H. K. Shah**, and J. S. Miller. "Solid-Phase Synthesis of Depsipeptidic Anticancer Natural Products and Analogs." Abstracts of Papers, 241st ACS National Meeting, Anaheim, CA, Mar 27-31, **2011**, ORGN-163.
- (15) **T. R. Blum, H. K. Shah, X. Zang, W. S. Perkins, A. R. Korn, D. M. Wholly**, and J. S. Miller. "Solution- and Solid-Phase Synthesis of Potential Anticancer HDAC Inhibitors." Abstracts of Papers, 240th ACS National Meeting, Boston, MA, Aug 22-26, **2010**, ORGN-937.
- (14) J. S. Miller. "Responsive Lecturing: Keeping the Tradition and Improving the Pedagogy." *HWS New Faculty Orientation*, Aug 25, **2009**. (invited lecture)
- (13) **D. M. Wholly, T. R. Blum, J. A. Walkley, K. A. Hlavac**, and J. S. Miller. "Total Synthesis of Cysteine-Containing, Depsipeptidic Natural Products in Solution and on the Solid Phase *via* Chemoselective Macrocyclization Using Latent Thioester Solid-Phase Linkers." Abstracts of Papers, 238th ACS National Meeting, Washington, D.C., Aug 16-20, **2009**, ORGN-785.
- (12) J. S. Miller. "Fighting Cancer One Molecule at a Time? A Total Synthesis of Spiruchostatin A." *Illinois Wesleyan University Natural Science Colloquium Series*, Apr 3, **2009**. (invited lecture)
- (11) J. S. Miller. "Lecturing Techniques that Engage Students." *HWS Faculty Institute: Teaching Practices in Context*, Jan 15, **2009**. (invited lecture)

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- (10) J. S. Miller. "Fighting Cancer One Molecule at a Time? A Total Synthesis of Spiruchostatin A." *Ithaca College Chemistry Department Seminar*, Dec 9, 2008. (invited lecture)
- (9) **K. A. Perri, N. A. Calandra, D. M. Wholly**, and J. S. Miller. "Key intermediate en route to the cyclic, cysteine-containing natural products Spiruchostatin A and B using a *thioester equivalent* ester functionality." Abstracts of Papers, 236th ACS National Meeting, Philadelphia, PA, Aug 17-21, 2008, ORGN-467.
- (8) J. S. Miller. "What is an NMR, and why should anyone care that we got one?" *Faculty Lunch Seminar Series*, October, 2007. (Lecture)
- (7) **N. D. Valente, K. A. Kocak, Y.-L. Cheng**, and J. S. Miller. "Toward the Fmoc Solid-Phase Synthesis of Native Chemical Ligation Precursors using *Thioester Equivalent* Ester Linkers." Abstracts of Papers, 234th ACS National Meeting, Boston, MA, Aug 19-23, 2007, ORGN-904.
- (6) **K. A. Kocak, K. A. Perri, Y.-L. Cheng**, and J. S. Miller. "Efficient Synthetic Route Toward the Cyclic, Cysteine-Containing Natural Products FK228 and the Spiruchostatins." Abstracts of Papers, 234th ACS National Meeting, Boston, MA, Aug 19-23, 2007, ORGN-840.
- (5) **K. S. McMenaman, Y.-L. Cheng, S. M. Weinstein**, and J. S. Miller. "*Thioester Equivalent* Linkers for the Fmoc Solid-Phase Synthesis of Native Chemical Ligation Precursors." Abstracts of Papers, 35th Northeast Regional Meeting of the American Chemical Society, Binghamton, NY, Oct 5-7, 2006, NRM-447.
- (4) **Y.-L. Cheng, G. M. Lippa, Z. J. Schonfield, K. A. Kocak**, and J. S. Miller. "Toward the Solid-Phase Synthesis of Cyclic, Cysteine-Containing, Depsipeptidic Natural Products FK228 and the Spiruchostatins." Abstracts, 35th Northeast Regional Meeting of the American Chemical Society, Binghamton, NY, Oct 5-7, 2006, NRM-445.
- (3) J. D. Warren, J. S. Miller, and S. J. Danishefsky. "Convergent Synthesis of Bifunctional Glycopeptides Bearing Differential Glycans." Abstracts of Papers, 228th ACS National Meeting, Philadelphia, PA, Aug. 22-26, 2004, ORGN-301.
- (2) J. S. Miller. "(Glyco)Peptides: Synthesis, Structure, and Application." *Columbia University Chemistry Department Seminar*, May, 2003. (Lecture)
- (1) J. S. Miller. "Efforts Towards the Synthesis of CP-263,114, A Highly Oxygenated Natural Product." *Organic Chemistry Graduate Symposium*, May, 1999. (Lecture)

RESEARCH EXPERIENCE

Professor, organic chemistry, HWS (*Assistant*, 2004 – 2010; *Associate*, 2010 – present)

- Design and construction of linkers for solid-phase peptide synthesis
- Synthesis of cysteine-containing natural products and analogues

Postdoctoral Research in bioorganic chemistry, SKI (2001 – 2004)

- Design of synthetic methodology for *N*-linked glycoprotein conjugates
- Synthesis of prostate specific antigen (PSA) glycopeptides
- Complex oligosaccharide synthesis

Graduate Research in organic and bioorganic chemistry, MIT (1995 – 2001)

- Design of a construct for studying the secondary structure of insoluble peptides
- Synthesis and characterization of solubilized polyalanines
- Determination of amino acid α -helical propensities
- Total synthesis of naturally occurring fungal metabolites

Senior Thesis Research in organometallic chemistry, Princeton (1994 – 1995)

- Mechanistic study of carbonyl reduction *via* metallocene borohydride reagents

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Undergraduate Research in inorganic chemistry, Princeton (1994)

- Preliminary design and synthesis of potential chemotherapy drugs

Summer Intern at the National Institutes of Health (1991 – 1993)

- Techniques for diagnosis of cancer and Gaucher's disease
- Nuclear magnetic resonance (NMR) imaging techniques
- NMR circuitry design and construction
- Development of a practical medical device for measuring blood hemoglobin content

SERVICE AND ADMINISTRATIVE EXPERIENCE

HWS Center for Teaching and Learning (CTL) Teaching Fellows program (2007 – present)

- Chemistry department liaison
- Helped initiate the program

HWS Honors program (2005 – present)

- Honors advisor, Wade Perkins (2012)
- Honors advisor, Deirdre Wholly (2011)
- Honors advisor, Travis Blum (2010)
- Honors advisor, Kimberly Hlavac (2009)
- Honors advisor, Yim Ling Cheng (2007)
- Honors Faculty Examiner (Emily Perkins, Lindsey Haun)
- Honors Field Examiner (Mike Liquori, Deirdra Evers, Megan Rechin, Catherine Downey)

Instrument care, maintenance responsibilities (HWS)

- Departmental SolvTek dry solvent purification system (2005 – present)
- Varian MR 400 MHz spectrometer (2008 – 2011)

Instrument care, maintenance responsibilities (Danishefsky Group Laboratory Manager, 2002 – 2004)

- Waters ZQ (and ZMD) with Micromass LCMS system
- PE Biosystems automated peptide synthesizer
- Labconco FreeZone 2.5 L lyophilizer
- Waters analytical and semiprep HPLC systems

HWS Committee on Standards (2009 – 2011; Chair 2010 – 2011)

HWS Health Professions Advisory Committee (2006 – present; Chair 2011 – present)

Health Professions Steering Committee (Chair, initiated in 2012 – present)

Barry M. Goldwater Scholarship Committee (2008 – 2011)

Elizabeth Blackwell Scholarship Committee (2008 – present)

NSF reviewer (2007 – present)

Reviewer: *Organic Letters*, *Tetrahedron Letters*, *Mini Reviews in Organic Chemistry*, Norton Publishing Group, Wiley International, Fundação para a Ciência e a Tecnologia (FCT, Portuguese Foundation for Science) (2008 – present)

HWS Club advising

- Ultimate Disc Club advisor (2010 – present)
- Chem Club advisor (2004 – 2007)
- Glassblowing Club advisor (2005 – 2006), assisted in forming the club

Laboratory Safety

- New York City Fire Department Charge of Chemical Laboratory Fitness (2002 – 2004)
- MIT Chemistry Department Safety Committee (1999 – 2000)
- MIT Laboratory Group Safety Coordinator (1998 – 2001)

PROFESSIONAL MEMBERSHIPS

American Chemical Society (ORGN: 1996 – present; AGFD: 2012 – present)

Sigma Xi Scientific Research Society (2005 – 2009)

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UNDERGRADUATE RESEARCH STUDENTS

- (28) **Alysa B. Sadkin**, William Smith '15 (*beginning Fall, 2013*)
- (27) **Amanda C. Rimsa**, William Smith '15 (*beginning Fall, 2013*)
- (26) **Janae N. Garofalo**, William Smith '15 (May 2013 – present), “Toward a Solid-Phase Synthesis of HDAC Inhibitor Spiruchostatin A”
- (25) **Stephanie L. Cramer**, William Smith '15 (May 2013 – present), “HDACi Cancer Therapeutic Laboratory Project: Depsipeptide Analog Synthesis”
- (24) **Melissa A. Mahajan**, William Smith '15 (May 2012 – December 2012), “Toward an Optimized Synthesis of HDAC Inhibitor Spiruchostatin A”
- (23) **Gregory B. Shelkey**, Hobart '14 (Sep 2011 – present), “New Reaction Conditions for Latent Thioester Chemoselective Ligation”
- (22) **Nicole M. Zanghi**, William Smith '14 (May 2011 – May 2012), “Solid-Phase Synthesis of Anticancer Agent FK228”
- (21) **Leila Peraro**, William Smith '13 (May 2011 – May 2013), “HDACi Cancer Therapeutic Laboratory Project: Depsipeptide Analog Synthesis”
- (20) **Heli K. Shah**, William Smith '13 (May 2010 – May 2013), “Attempted Synthesis of ”
- (19) **Xiaoyu Zang**, William Smith '13 (May 2010 – present), “Total Synthesis of Anticancer HDAC Inhibitor Natural Products and Analogs”
- (18) **Ariella R. Korn**, William Smith '12 (May 2010 – Aug 2010), “Synthesis of an Enantiomerically Pure Linker for Chemoselective Ligation”
- (17) **Wade S. Perkins**, Hobart '12 (May 2010 – May 2012), “Preparation of a Nagao-Functionalized Hydroxymercaptoheptanoate for Cyclic Depsipeptide Analog Synthesis” (2010) and “New Reaction Conditions for Unmasking Latent Thioesters” (2011)
- (16) **Travis R. Blum**, Hobart '10 (May 2009 – May 2010), “Synthesis of Cysteine-Containing, Depsipeptidic Natural Products and Analogs in Solution and on the Solid Phase *via* Chemoselective Macrocyclization using Latent Thioesters”
- (15) **Janelle A. Walkley**, William Smith '09 (May 2009 – Aug 2009), “Total Synthesis of Cysteine-Containing, Depsipeptidic Natural Products on the Solid Phase using Latent Thioester Linkers”
- (14) **Kimberly A. Hlavac**, William Smith '09 (Sep 2008 – May 2009), “Crucial Intermediates for the Solid-Phase Synthesis of FK228 and the Spiruchostatins”
- (13) **Yessica Baez-Sosa**, William Smith '09 (May 2008 – Jan 2009), “Crucial Intermediates for the Solid-Phase Synthesis of FK228 and the Spiruchostatins”
- (12) **Deirdre M. Wholly**, William Smith '11 (May 2008 – May 2011), “Linkers for the Solid-Phase Synthesis of Latent Peptide Thioesters” and “Toward the Total Synthesis of Anticancer Agent FK228”
- (11) **Nicole A. Calandra**, William Smith '09 (May 2008 – May 2009), “The Total Synthesis of Potential Anticancer Agent Spiruchostatin A”
- (10) **Katherine A. Perri**, William Smith '10 (May 2007 – Aug 2008), “Toward the Total Synthesis of Cyclic, Cysteine-Containing Natural Products FK228 and the Spiruchostatins”

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- (9) **Nicholas D. Valente**, Hobart '09 (May 2007 – Aug 2007), “Linkers for the Solid-Phase Synthesis of Cyclic, Cysteine-Containing Natural Products FK228 and the Spiruchostatins”
- (8) **Kimberly A. Kocak**, William Smith '08 (Jun 2005 – May 2008), “Toward the Solid-Phase Synthesis of Cyclic, Cysteine-Containing Natural Products FK228 and the Spiruchostatins”
- (7) **Zachary J. Schonfield**, Hobart '08 (Jun 2005 – Aug 2006), “Crucial Intermediates for the Solid-Phase Synthesis of FK228 and the Spiruchostatins”
- (6) **Yim Ling Cheng**, William Smith '07 (Jun 2005 – May 2007), “Toward the Total Synthesis of Potential Anticancer Agent Spiruchostatin A and Its Analogs”
- (5) **Kathryn S. McMenaman**, William Smith '07 (Sep 2005 – Jan 2006), “Completion of Two Resins for the Solid-Phase Synthesis of Potential Anticancer Agents FK228 and the Spiruchostatins”
- (4) **Geoffrey M. Lipka**, Hobart '07 (Jun 2005 – Jul 2006), “An Intermediate for the Solid-Phase Synthesis of Potential Anticancer Agents FK228 and Spiruchostatins A and B”
- (3) **Sarah M. Weinstein**, William Smith '07 (Jun 2005 – Jul 2005), “Potential Linkers for the Solid-Phase Synthesis of Native Chemical Ligation Precursors”
- (2) **Brooke A. Denslow-Chase**, William Smith '05 (Sep 2004 – May 2005), “Linkers for the Solid-Phase Synthesis of Peptide Thioester Equivalents”
- (1) **Gregory J. Sand**, Hobart '05 (Jul 2004 – May 2005), “Toward the Total Synthesis of Cyclic Peptidic Gene Expression Promoters”

PERSONAL INTERESTS

Ultimate disc, carpentry, travel/hiking, biking, cooking, arranging and performing vocal music