David Adam Spiegel, Ph.D., M.D.

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EDUCATION

Yale University, New Haven, Connecticut, 1996-2004
Ph.D. in Organic Chemistry, December 7, 2004
M.D., May 24, 2004
M.S. in Pharmacology, 2000

Harvard University, Cambridge, Massachusetts, 1991-1995
A.B. in Chemistry, *Magna Cum Laude* with highest honors in Chemistry

HONORS AND AWARDS

2011	Alfred P. Sloan Foundation Fellowship
2010	Nature Chemical Biology Grand Challenges Essay Contest
2009	Bill and Melinda Gates Foundations Grand Challenges Explorations Award
2008	Ellison Foundation New Scholar Award
2007	NIH Director's New Innovator Award
2007	Camille and Henry Dreyfus New Faculty Award
2005-2007	NIH Ruth L. Kirchstein National Research Service Award Fellowship
2001-2002	NIH Cancer Education Program Fellow
1995-1996	Rotary Foundation Walter D. Head Memorial Fellowship for Study Abroad
1994-1995	Barry M. Goldwater Fellowship for Excellence in Science
1994	Rockefeller University Summer Undergraduate Research Fellowship
1992-1995	John Harvard Fellowship (awarded by semester)

PROFESSIONAL EXPERIENCE

2008-present Assistant Professor of Pharmacology, Yale University

2007-present Assistant Professor of Chemistry, Yale University

2005-2007 NIH Postdoctoral Research Fellow, The Broad Institute of Harvard and M.I.T. (Advisor: Prof. Stuart L. Schreiber). Developed a novel oligomer-based synthetic approach for the synthesis of skeletally diverse small molecules to be used as biological probes. Participated in the screening and biological annotation of small-molecules synthesized through this approach. Worked to develop a yeast-based phenotypic screen to classify the pharmacology of biologically active small-molecules.

2000-2005 (Ph.D. research) Graduate Research Assistant in Synthetic Organic Chemistry, Yale University. (Advisor: Prof. John L. Wood). Discovered a practical, environmentally benign method for the deoxygenation of alcohols that utilizes water as the H-atom source. Conducted studies toward the total syntheses of phomoidrides A and B (CP-225,917 and CP-263,114).

1999-2000 Graduate Research Assistant in Bioorganic Chemistry, Yale University. (Advisor:

Prof. Andrew D. Hamilton). Conducted kinetic studies to explore the interaction between a calix[4]arene tetrapeptide derivative and the enzyme thrombin. Analyzed and screened a solution-phase library of calix[4]arene tetrapeptides using MALDI-TOF mass spectrometry.

1996-1999 Medical Student, Yale University. Passed both USMLE Step 1 and USMLE Step 2 exams. Received Honors evaluations in all clinical clerkships, including Internal Medicine, Surgery, Psychiatry, Neurology, Obstetrics and Gynecology, and Pediatrics.

1995-1996 Rotary Foundation Walter D. Head Fellow, Trinity College, Dublin, Ireland. Participant in courses of study in the areas of mathematics and computer science.

1993-1995 Undergraduate Reasearch Assistant, Harvard University Department of Chemistry. (Advisor: Prof. Yoshito Kishi). Studied the development of an enantioselective nickel-chromium catalyzed coupling reaction using chiral solvent systems.

1990-1991 Research Assistant in Neuroanesthesia Laboratory. Studied the central nervous system toxicities of local anesthetic mixtures in a rat model.

PUBLICATIONS

Publications as an Independent Investigator

Spiegel DA. Synthetic Immunology to Engineer Human Immunity. *Nature Chemical Biology*. **2010**; 6; 871-872. Chosen as one of eight recipients of the 2010 Grand Challenges in Chemical Biology Competition.

Nelson JW, Chamessian AG, McEnaney PJ, Kazmierczak BI, Spiegel DA. A Biosynthetic Strategy for Re-engineering the S. aureus Cell Wall with Non-Native Small Molecules. *ACS Chemical Biology*. **2010**, 1147-1155.

- **Supported by** Gates Grand Challenges Explorations Award, NIH Director's New Innovator Award
- Highlighted as Leading Edge Article in *Cell*, **2010**, *143*, 493.
- Most read article in *ACS Chemical Biology* during the months of October through December, 2010.
- Rated as one of top 20 most read articles in *ACS Chemical Biology* during all of 2010.
- Highlighted in *Biotechniques*, November 11, 2010. (http://www.biotechniques.com/news/Bacterial-cell-walls-unlocked/biotechniques-305825.html).
- Highlighted in Sciencedaily, October 8, 2010. (http://www.sciencedaily.com/releases/2010/10/101007171415.htm)
- Highlighted in Physorg.com, October 7, 2010. (http://www.physorg.com/news205677299.html)
- Highlighted in e! Science News, October 7, 2010. (http://esciencenews.com/articles/2010/10/07/scientists.trick.bacteria.with.small.molecules)
- Highlighted in Infection Control Today, October 7, 2010. (http://www.infectioncontroltoday.com/s.aspx?exp=1&u=http%3A//www.infectioncontroltoday.com/news/2010/10/scientists-trick-bacteria-with-small-molecules.aspx)
- Highlighted in Infection Research, October 12, 2010. (http://www.infection-research.de/news/detail/pressrelease/scientists_trick_bacteria_with_small_molecules/)
- Highlighted in Microbe World, October 8, 2010. (http://www.microbeworld.org/index.php?option=com_jlibrary&view=article&id=4979)

- Featured as Editor's Choice article in Medical News Today, October 9, 2010. (http://www.medicalnewstoday.com/articles/203946.php)
- Highlighted by R&D Magazine, October 7, 2010. (http://www.rdmag.com/News/Feeds/2010/10/manufacturing-scientists-trick-bacteria-with-small-molecules/)

Zhang AX, Murelli RP, Barinka C, Michel J, Cocleaza A,** Jorgensen WL, Lubkowski J, **Spiegel DA**. A Remote Arene-Binding Site on Prostate Specific Membrane Antigen Revealed by Antibody-Recruiting Small Molecules. *Journal of the American Chemical Society*. **2010**, 12711-12716

- **Indicates undergraduate co-author.
- **Supported by** NIH Director's New Innovator Award
- Featured as a Science and Technology Concentrate in Chemical and Engineering News *C&E News* **2010**, *88* [36], 58. (http://pubs.acs.org/isubscribe/journals/cen/88/i36/html/8836scic2.html)
- Featured as Research Highlight in *Nature Chemical Biology*, **2010**, *6*, 698.

Murelli RM, Zhang AX, Michel J, Jorgensen WL, Spiegel DA. Chemical control over immune recognition: A class of antibody-recruiting small molecules that target prostate cancer. *Journal of the American Chemical Society*. **2009**; 131; 17090-17092.

- **Supported by** NIH Director's New Innovator Award
- Featured as a News Article in Drug Discovery News, March 8, 2010, (http://www.drugdiscoverynews.com/index.php?newsarticle=3687)
- Featured in *ChemBioChem* as the focus of a review article entitled "Antibody Recruiting Small Molecules: A New Option for Prostate Tumor Therapy by PSMA Targeting", **2010**, *11*, 1052-4.
- Highlighted on the "Faculty of 1000" (http://f1000biology.com/article/id/1732956), and was ranked as the fifth most cited paper in the field of Chemical Biology in February, 2010.
- Featured as a news story in *ACS Chemical Biology*, **2009**, *4*, 975.
- Highlighted by Popular Science magazine, November 11, 2009. (http://www.popsci.com/science/article/2009-11/synthetic-molecules-trick-body-immune-response-hiv-prostate-cancer)
- Highlighted in Science Daily, November 8, 2009 (http://www.sciencedaily.com/releases/2009/11/091105165527.htm)
- Highlighted by R&D Magazine, November 6, 2009. (http://www.rdmag.com/News/2009/11/Life-Science-Synthetic-Molecules-Trigger-Immune-Response-To-HIV)
- Highlighted in Genetic Engineering & Biotechnology News, November 6, 2009. (http://www.genengnews.com/news/bnitem.aspx?name=67643130)
- Highlighted in e! Science News, November 5, 2009 (http://esciencenews.com/articles/2009/11/05/new.synthetic.molecules.trigger.immune.response.hiv.and.prostate.cancer)

Stern E, Jay SM, Demento SL, Murelli RP, Reed MA, Malinski T, Spiegel DA, Mooney DJ, Fahmy TM. Spatiotemporal control over molecular delivery and cellular encapsulation from electropolymerized micro- and nanopatterned surfaces. *Advanced Functional Materials*. **2009**; 19; 2888-2895.

- **Supported by** NIH Director's New Innovator Award

Parker CG, Domaoal RA, Anderson KS, Spiegel DA. An antibody-recruiting small molecule that targets HIV gp120. *Journal of the American Chemical Society*. **2009**;131: 16392-16394. This work was featured as a news story in *ACS Chemical Biology*, **2009**, *4*, 975.

- **Supported by** NIH Director's New Innovator Award

- Featured as a News Article in Drug Discovery News, March 8, 2010, (http://www.drugdiscoverynews.com/index.php?newsarticle=3687) Featured as a news story in *ACS Chemical Biology*, **2009**, *4*, 975.
- Highlighted by Popular Science magazine, November 11, 2009. (http://www.popsci.com/science/article/2009-11/synthetic-molecules-trick-body-immune-response-hiv-prostate-cancer)
- Highlighted in Science Daily, November 8, 2009 (http://www.sciencedaily.com/releases/2009/11/091105165527.htm)
- Highlighted by R&D Magazine, November 6, 2009. (http://www.rdmag.com/News/2009/11/Life-Science-Synthetic-Molecules-Trigger-Immune-Response-To-HIV)
- Highlighted in Genetic Engineering & Biotechnology News, November 6, 2009. (http://www.genengnews.com/news/bnitem.aspx?name=67643130)
- Highlighted in e! Science News, November 5, 2009 (http://esciencenews.com/articles/2009/11/05/new.synthetic.molecules.trigger.immune.response.hiv.and.prostate.cancer)

Publications from Graduate and Postdoc Research

Spiegel DA, Schroeder FC, Duvall J, Schreiber SL. An oligomer-based approach to skeletal diversity in small-molecule synthesis. *Journal of the American Chemical Society*. **2006**; 128: 14766-14767.

- Featured as a Science and Technology Concentrate in *C&E News* **2006**, *84* [46], 35.

Spiegel DA, Wiberg KB, Schacherer LN, Medeiros MR, Wood JL. Deoxygenation of alcohols using water as the hydrogen atom source. *Journal of the American Chemical Society*. **2005**; 127: 12513-12515.

- This work was featured as a news story in *C&E News* **2005**, *83* [35], 9.

Medeiros MR, Schacherer LN, Spiegel DA, Wood JL. *Organic Letters*. **2007**; 9; 4427-4429.

Spiegel DA, Njardarson JT, McDonald IM, Wood JL. The art of innovation in organic chemistry: Synthetic efforts toward the phomoidrides. *Chemical Reviews.* **2003**; 103; 2691-2727

Spiegel DA, Njardarson JT, Wood JL. CP-263,114 synthetic studies. Construction of an isotwistane ring system via rhodium carbenoid C–H insertion. *Tetrahedron*. **2002**; 58; 6545-6554.

Njardarson JT, McDonald IM, Spiegel DA, Inoue M, Wood JL. An expeditious approach toward the total synthesis of CP-263,114. *Organic Letters*. **2001**; 3; 2435-2438

Spiegel DA, Dexter F, Warner DS, Baker MT, Todd MM. Central nervous system toxicities of local anesthetic mixtures in the rat. *Anesthesia and Analgesia.* **1992**; 75; 922-928.

RESEARCH SUPPORT

Ongoing Research Support

1DP2OD002913-01 2007 Spiegel (PI) 09/25/07 – 09/24/12
National Institutes of Health Director's New Innovator Award Program
Project Title: "Small-Molecule Antibody Recruiting Therapeutics for Treating Human Disease"
This research centers upon the development of small-molecules capable of redirecting the function of the human immune system in the treatment of cancer and HIV.

AG-NS-0487-08 2007 Spiegel (PI) 07/15/08 – 07/14/12

Ellison Medical Foundation New Scholar Award in Aging
Project Title: "Effects of Advanced Glycation End-Products on Human Aging – A Chemical Approach"
The purpose of this research is to enable synthetic access to advanced glycation end-products (AGEs) in chemically homogeneous form, with the ultimate goal of systematically exploring their role in human health and disease.

3DP2OD002913-01S1 Spiegel (PI) 09/22/2009 – 09/24/12
NIH Director's New Innovator Award Program Administrative Supplement
Project Title: "Small-Molecule Antibody Recruiting Therapeutics for Treating Human Disease"
This supplement supports the purchase of flow cytometry equipment and the hiring of personnel to operate such equipment; it is intended to accelerate the pace of research efforts toward the 1DP2OD002913-01 award listed above.

Completed Research Support

Grand Challenges Explorations Award Spiegel (PI) 04/01/2009 - 03/31/2010
Bill and Melinda Gates Foundation
Project Title: Biosynthetic Immunotargeting for Pneumococcal Treatment
This research focuses upon the development of small-molecules capable of enhancing immune recognition of *Streptococcus pneumoniae* (pneumococcus).

Camille and Henry Dreyfus Foundation
New Faculty Award 2007 Spiegel (PI) 07/26/2007-07/25/2008
Project Title: A Synthetic Approach to Studying Advanced Glycation End-Products, a Class of Natural Products Found in Humans
The purpose of this research was to develop synthetic methods and materials to enable the study of non-enzymatic posttranslational modifications of proteins known as advanced glycation end-products (AGEs).

TEACHING

Fall 2007	Chem 423/523: "Advanced Synthetic Methods"
Fall 2008	Chem 423/523: "Advanced Synthetic Methods"
Spring 2009	Chem 221: "The Organic Chemistry of Life Processes"
Fall 2009	Chem 423/523: "Advanced Synthetic Methods"
Spring 2010	Chem 221: "The Organic Chemistry of Life Processes"

SERVICE

2007–present	Instrument Committee, Yale University Chemistry Department
2007–present	Junior Faculty Search Committee, Yale University Chemistry Department
2007–present	MD/PhD Program Admissions Committee, Yale Medical School
2007, November	Speaker and Panelist at Alumni Reunion Event, Yale University Chemistry Department
2007, Fall	Graduate Student Admissions Committee, Yale University Chemistry Department
2008, Fall	Diversity Officer, Junior Faculty Search Committee, Yale University Chemistry Department
2009, January	Panelist for Yale Graduate Workshop: "Navigating the Academic Job Market"

2009, Fall–2010, Spring	Chair of Seminar Committee, Yale University Chemistry Department
2009, Fall	Diversity Officer, Junior Faculty Search Committee, Yale University Chemistry Department
2010, Spring	Graduate Student Admissions Committee, Yale University Chemistry Department
2010-present	Yale West Campus Chemical Biology Institute Steering Committee Member

INVITED PRESENTATIONS

September 21, 2007	Hunter College, New York, NY
February 19, 2008	*Research In Progress Seminar Series*, MSTP Program, Yale University
November 11, 2008	*Research In Progress Seminar Series*, MSTP Program, Yale University
December 1, 2008	Department of Pharmacology, Yale University
March 30, 2009	NIH Mentoring Workshop, University of Texas Southwestern Medical Center, Dallas, TX
May 4, 2009	*Yale Science Forum*, Yale University
May 15, 2009	Chemical Biology Symposium, Yale University
October 7, 2009	Developmental Therapeutics Program, Yale University
October 10, 2009	*Transfusion Immunology Consortium Seminar Series*, Columbia University, New York, NY
November 12, 2009	University of Kentucky, Department of Pharmacy, Lexington, KY
December 2, 2009	Broad Institute of Harvard and MIT, Cambridge, MA
December 8, 2009	The Scripps Research Institute, Jupiter, Fl
January 26, 2010	Bristol-Myers-Squibb, Medicinal Chemistry and Virology, Wallingford, CT
March 24, 2010	American Chemical Society National Meeting, ACS Chemical Biology Award Symposium Honoring Professor Alanna Schepartz, San Franscisco, CA
April 2, 2010	Trinity College, Department of Chemistry, Hartford, CT
May 21, 2010	International Flavors and Fragrances Corporation, Fragrances Division, Union Beach, NJ
June 11, 2010	Section of Virology, Yale University
June 14, 2010	Gordon Research Conference in Bioorganic Chemistry, Andover, NH
June 22, 2010	24th Annual Symposium on HIV/AIDS Structural Biology, National Institutes of Health, Bethesda, MD
July 13, 2010	Harvard Medical School, Section of Microbiology
July 20, 2010	International Flavors and Fragrances, Union City, NJ
September 15, 2010	Tri-Institutional Transfusion Immunology Consortium
October 4, 2010	Wellcome Trust Presentation at Yale University
October 21, 2010	University of Texas Southwestern Medical Center
November 7, 2010	New Horizons National Meeting for Science Journalists, New Haven, CT
January 3, 2011	Biology of Aging Interest Group, Yale University