

## CURRICULUM VITAE

### Philip Paul Garner

Department of Chemistry  
Case Western Reserve University  
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### DATE & PLACE OF BIRTH

June 4, 1955  
Greensburg, PA

### EDUCATION

1973-1977 B.S. in Chemistry, University of Pittsburgh

1977-1981 Ph.D. in Organic Chemistry, University of Pittsburgh

### HONORS

University of Pittsburgh Scholarship (1973-1977)

Freshman Honor Society (Phi Eta Sigma)

Nominated for the Carle F. Wittke Award for Excellence in Undergraduate Teaching (2005)

### RESEARCH & TEACHING EXPERIENCE

1995- *Professor of Chemistry*  
Case Western Reserve University

1990-1995 *Associate Professor of Chemistry*  
Case Western Reserve University

1985-1990 *Assistant Professor of Chemistry*  
Case Western Reserve University

1983-1985 *Assistant Professor of Chemistry*  
Illinois Institute of Technology

1981-1983 *Postdoctoral Studies with Professor Paul A. Grieco*  
Indiana University

1977-1981 *Graduate Studies with Professor Paul Dowd*  
University of Pittsburgh

## PROFESSIONAL ACTIVITIES

- Member of NIH Fellowship Review Panel (Chemical & Bioanalytical Sciences), March 2005, July 2005, March 2006, and November 2006
- Member of American Cancer Society Institutional Research Grant Review Committee, November 2005
- Visiting Professor*, Middle East Technical University, Ankara TURKEY, September 2004
- Member, Case Comprehensive Cancer Center, 2003 – present
- Chercheur Invité*, Institute de Recherches Cliniques de Montréal, 2002
- Ad hoc* member of Medicinal Chemistry Study Section (NIGMS), 2002
- Ad hoc* member of Bioorganic and Natural Products Study Section (NIGMS), 2000
- Ad hoc* reviewer for National Science Foundation (NSF), 1985 – present
- Reviewer for *J. Am. Chem. Soc.*, *J. Org. Chem.*, *Organic Lett.*, *Chem. Rev.*, *Tetrahedron Lett.*, *Tetrahedron*, *Synthesis*, and *Biochemistry*

## SOCIETY MEMBERSHIP

American Chemical Society

## Ph.D. DISSERTATION

*Studies Directed Towards the Synthesis of 2,4-Dimethylenebicyclo[1.1.1]pentan-2-one*", 1981

## RESEARCH INTERESTS

Research interests include the total synthesis of bioactive small molecules (both natural products and "natural product-like" molecules), the development of new reaction methodology for organic (especially asymmetric) synthesis, and the invention of novel gene-targeting drug platforms. Our expertise in the area of molecular synthesis is brought to bear on these problems, with medicinal chemistry as the unifying theme. Current research projects include the total synthesis of the antitumor antibiotic bioxalomycin  $\beta$ 1 and neuroprotective agent kaitocephalin, the development of new reactions for the asymmetric synthesis of functionalized pyrrolidines, and the design of cell permeable, DNA- and RNA-targeting helical nucleopeptides. The "privileged" molecules that are produced during our synthetic studies are subjected to functional biological assays through collaborative arrangements.

## SCIENTIFIC ACCOMPLISHMENTS

- Development of a serinal derivative that is widely used as a chiral building block. (For a review of "Garner's aldehyde", see: Liang *et al.* *J. Chem. Soc., Perkin Trans. 1*, **2001**, 2136.)
- Demonstration of the utility of the "Garner aldehyde" for synthesis of the polyoxin and amipurimycin families of peptidyl nucleoside antibiotics as well as the synthesis of sphingosines.
- Completion of the first asymmetric synthesis of the tetrahydroisoquinoline antibiotic (-)-quinocarcin (1992). A key element of this total synthesis was the strategic use of Huisgen's photolytic generation of a cyclic azomethine ylide and its stereocontrolled 1,3-dipolar cycloaddition reaction.
- First demonstration that disposable silicon tethers can be used to control the stereochemical outcome of intramolecular azomethine ylide cycloaddition reactions (1994).
- Development of an acetal-based chiral auxiliary for hydroxyalkyl radicals (1995). This technology offered a novel way to control the stereochemical outcome of hydroxyalkyl radical additions.
- Development of a practical chiral azomethine ylide that uses Oppolzer's chiral sultam to enhance reactivity and control facial selectivity. Our recent work in this area has resulted in a multicomponent approach to previously inaccessible complex pyrrolidines.
- Development of novel nucleic acid surrogates that combine the codified molecular recognition of nucleic acids with the structural variability of peptides/proteins. These cell-permeable helical nucleopeptides could have a significant impact on both antisense and antigene drug development.

## PUBLICATIONS

1. Irgartinger, H.; Goldmann, A.; Schappert, R.; Garner, P.; Dowd, P. "Synthesis and X-ray Crystal Structure of 1,5-Bis(acetoxymethyl)tricyclo[2.1.0.0<sup>2,5</sup>]pentan-3-one" *J.C.S. Chem. Comm.* **1981**, 455
2. Paddon-Row, M. N.; Houk, K. N.; Dowd, P.; Garner, P.; Schappert, R. "Synchronized Distortions of Bicyclobutanes" *Tetrahedron Lett.* **1981**, 22, 4799
3. Dowd, P.; Schappert, R.; Garner, P. "Rearrangement of Substituted Tricyclo[2.1.0.0<sup>2,5</sup>]pentan-3-ones" *Tetrahedron Lett.* **1982**, 23, 3
4. Dowd, P.; Schappert, R.; Garner, P. "Nucleophilic Ring-Opening and Fragmentation in the Tricyclo[2.1.0.0<sup>2,5</sup>]pentan-3-one Series" *Tetrahedron*

*Letts.* **1982**, 23, 7

5. Dowd, P.; Garner, P.; Schappert, R.; Irgartinger, H.; Goldmann, A. "Synthesis of 1,5-disubstituted Tricyclo[2.1.0.0<sup>2,5</sup>]pentanes. The Crystal and Molecular Structures of 1,5-Bis(acetoxymethyl)tricyclo[2.1.0.0<sup>2,5</sup>] pentan-3-one" *J. Org. Chem.* **1982**, 47, 4240
6. Grieco, P. A.; Garner, P.; He, Z. "Micellar Catalysis in the Aqueous Intermolecular Diels-Alder Reaction: Rate Acceleration and Enhanced Selectivity" *Tetrahedron Lett.* **1983**, 24, 1897
7. Grieco, P. A.; Yoshida, K.; Garner, P. "Aqueous Intermolecular Diels-Alder Chemistry: Reactions of Diene Carboxylates with Dienophiles in Water at Ambient Temperatures" *J. Org. Chem.* **1983**, 48, 3137
8. Grieco, P. A.; Garner, P.; Yoshida, K.; Huffman, J. C. "Aqueous Intermolecular Diels-Alder Chemistry: Novel Products Derived from Substituted Benzoquinone-Diene Carboxylate Adducts via Tandem Michael Reactions" *Tetrahedron Lett.* **1983**, 24, 3807
9. Garner, P. "Stereocontrolled Addition to a Penaldic Acid Equivalent: An Asymmetric Synthesis of threo- $\beta$ -Hydroxy-L-glutamic Acid" *Tetrahedron Lett.* **1984**, 25, 5855
10. Dowd, P.; Schappert, R.; Garner, P.; Go, C. L. "Halogenation and Rearrangement Reactions of Substituted Tricyclo[2.1.0.0<sup>2,5</sup>]pentan-3-ones" *J. Org. Chem.* **1985**, 50, 44
11. Irgartinger, H.; Goldmann, A.; Schappert, R.; Garner, P.; Go, C. L.; Dowd, P. "Direct Observation of the Effect of Transannular Interaction on the Single Bond Lengths of Tricyclo[2.1.0.0<sup>2,5</sup>]pentane Derivatives" *J.C.S Chem. Comm.* **1985**, 113
12. Garner, P.; Park, J. M.; Rotello, V. "An Enantioselective Synthesis of the Carzinophilin Degradation Product (2S,3S) 4-Amino-2,3-Dihydroxy-3-Methylbutyric Acid" *Tetrahedron Lett.* **1985**, 26, 3299
13. Garner, P.; Ramakanth, S. "Stereodivergent Syntheses of threo- and erythro-6-Amino-6-deoxyheptosulose Derivatives via an Optically Active Oxazolidine Aldehyde" *J. Org. Chem.* **1986**, 51, 2609
14. Garner, P.; Park, J. M. "A Convenient Preparation of 2-Benzyloxy-acetaldehyde" *Synth. Comm.* **1987**, 189
15. Garner, P.; Park, J. M. "The Synthesis and Configurational Stability of Differentially Protected  $\beta$ -Hydroxy- $\alpha$ -Amino Aldehydes" *J. Org. Chem.* **1987**, 52, 2361

16. Garner, P.; Ramakanth, S. "Stereoselective Synthesis of Acyclic and Exocyclic Olefins via a Hydroxyl Directed Wittig Reaction" *J. Org. Chem.* **1987**, *52*, 2629
17. Brandes, E.; Grieco, P. A.; Garner, P. "Diastereoselection in an Aqueous Diels-Alder Reaction: A Formal Total Synthesis of the Inhoffen-Lythgoe Diol" *J. Chem. Soc., Chem. Commun.* **1988**, 500
18. Garner, P.; Ramakanth, S. "A Regiocontrolled Synthesis of N<sup>7</sup>- and N<sup>9</sup>-Guanine Nucleosides" *J. Org. Chem.* **1988**, *53*, 1294
19. Irgartinger, Goldmann, A.; Huber-Patz, U.; Garner, P.; Paik, Y. H.; Dowd, P. "Substituent Effects on the Bicyclo[1.1.0]butane System. Structures of Bicyclo[1.1.0]butane Derivatives Substituted by Carbonyl and Carboxylate Groups" *Acta Cryst.* **1988**, *C44*, 1472
20. Garner, P.; Park, J. M. "An Asymmetric Synthesis of 5-O-Carbamoyl-polyoxamic Acid From D-Serine" *J. Org. Chem.* **1988**, *53*, 2979
21. Irgartinger, H.; Reimann, W.; Garner, P.; Dowd, P. "Structure Determination of Bicyclo[1.1.1]pentane Diesters" *J. Org. Chem.* **1988**, *53*, 3046
22. Garner, P.; Sunitha, K.; Shanthilal, P. "An Approach to the 3,8-Diazabicyclo[3.2.1]octane Moiety of Naphthyridinomycin and Quinocarcin via 1,3-Dipolar Cycloaddition of a Photochemically Generated Azomethine Ylide" *Tetrahedron Lett.* **1988**, *29*, 3525
23. Garner, P.; Park, J. M.; Malecki, E. "A Stereodivergent Synthesis of D-erythro-Sphingosine and D-threo-Sphingosine From L-Serine" *J. Org. Chem.* **1988**, *53*, 4395
24. Garner, P.; Sunitha, K.; Ho, W.-B.; Youngs, W. J.; Kennedy, V. O.; Djebli, A. "An Asymmetric Approach to Naphthyridinomycin and Quinocarcin via a Remarkably Selective Intramolecular 1,3-Dipolar Cycloaddition Reaction" *J. Org. Chem.* **1989**, *54*, 2041
25. Grieco, P. A.; Parker, D. T.; Garner, P.; Sasaki, S. "Chemical Transformations in the Quassinoid Series: Construction of the C(8), C(11) Bridged Hemiketal Ring System of Chaparrinone and Related Quassinoids" *Tetrahedron Lett.* **1989**, *30*, 3401
26. Garner, P.; Park, J. M. "Glycosyl  $\alpha$ -Aminoacids via Stereocontrolled Buildup of a Penaldic Acid Equivalent. An Asymmetric Synthesis of Thymine Polyoxin C" *Tetrahedron Lett.* **1989**, *30*, 5065

27. Garner, P.; Arya, F.; Ho, W.-B. "A Novel Approach to Complex Pyrrolidines via a Tandem Michael Reaction/1,3-Dipolar Cycloaddition Sequence" *J. Org. Chem.* **1990**, *55*, 412
28. Irgartinger, H.; Reimann, W.; Dowd, P.; Garner, P. "Electron Density Distribution in the Bonds and Nonbonded Contacts of a Bicyclo[1.1.1]pentane Derivative" *J.C.S Chem. Comm.* **1990**, 429
29. Garner, P.; Park, J. M. "Glycosyl  $\alpha$ -Aminoacids via the Stereocontrolled Buildup of a Penaldic Acid Equivalent. A Novel Synthetic Approach to the Nucleosidic Component of the Polyoxins and Related Substances" *J. Org. Chem.* **1990**, *55*, 3772
30. Garner, P.; Ho, W. B. "Stereoselective 1,3-Dipolar Cycloadditions of Photochemically Generated Azomethine Ylides to Oppolzer's Chiral Acryloyl Sultam. An Asymmetric Approach to Quinocarcin" *J. Org. Chem.* **1990**, *55*, 3973
31. Garner, P.; Park, J. M. "1,1-Dimethylethyl (S) or (R)-4-Formyl-2,2-dimethyl-3-oxazolidinecarboxylate: A Useful Serinal Derivative" *Org. Synth.* **1991**, *70*, 18
32. Garner, P.; Ho, W. B.; Grandhee, S. K.; Kennedy, V. O.; Youngs, W. J. "Development of an Asymmetric Approach to the 3,8-Diazabicyclo [3.2.1]octane Moiety of Quinocarcin via Intermolecular 1,3-Dipolar Cycloadditions of Photochemically Generated Azomethine Ylides" *J. Org. Chem.* **1991**, *56*, 5893
33. Garner, P.; Ho, W. B.; Shin, H. "Asymmetric Synthesis of (-)-Quinocarcin" *J. Am. Chem. Soc.* **1992**, *114*, 2767
34. Garner, P.; Yoo, J. U.; Sarabu, R. "Synthesis of 2-Aminopurine Nucleosides via Regiocontrolled Glycosylation" *Tetrahedron* **1992**, *48*, 4259
35. Garner, P.; Yoo, J. U. "Peptide-Based Nucleic Acid Surrogates Incorporating Ser[CH<sub>2</sub>B]-Gly Subunits" *Tetrahedron Lett.* **1993**, *34*, 1275
36. Garner, P.; Ho, W. B.; Shin, H. "The Asymmetric Synthesis of (-)-Quinocarcin via a 1,3-Dipolar Cycloadditive Strategy" *J. Am. Chem. Soc.* **1993**, *115*, 10742
37. Garner, P.; Dogan, Ö. "Auxiliary Controlled 1,3-Dipolar Cycloadditions of Chiral Stabilized Azomethine Ylides" *J. Org. Chem.* **1994**, *59*, 4
38. Garner, P.; Dogan, Ö.; Pillai, S. "Auxiliary Mediated Synthesis of Aziridine-2-carboxylic Acid Derivatives" *Tetrahedron Lett.* **1994**, *35*, 1653

39. Garner, P. P.; Cox, P. B.; Klippenstein, S. J.; Youngs, W. J.; McConville, D. B. "Tether Mediated Stereocontrol in Intramolecular Azomethine Ylide Cycloadditions" *J. Org. Chem.* **1994**, *59*, 6510
40. Garner, P. P.; Cox, P. B.; Klippenstein, S. J. "Auxiliary Induced p-Stereocontrol in Acetaloxyalkyl Radical Addition Reactions" *J. Am. Chem. Soc.* **1995**, *117*, 4183
41. Garner, P.; Leslie, R.; Anderson, J. T. "A Radical Approach to Asymmetric Aldol Synthesis" *J. Org. Chem.* **1996**, *61*, 6754
42. Garner, P.; Cox, P. B.; Anderson, J. T.; Protasiewicz, J.; Zaniewski, R. "The Use of Silicon-Based Tethers to Control Diastereofacial Selectivity in Azomethine Ylide Cycloadditions" *J. Org. Chem.* **1997**, *62*, 493
43. Garner, P.; Anderson, J. T. "A Rationally Designed Chiral Auxiliary for Hydroxyalkyl Radicals Leads to Exceptional p-Stereocontrol" *Tetrahedron Lett.* **1997**, *38*, 6647
44. Garner, P.; Yoo, J. U.; Sarabu, R.; Kennedy, V. O.; Youngs, W. J. "Stereocontrolled and Enantioselective Synthesis of the Branched 6-Amino-4,6-deoxyheptopyranuronic Acid Component of Amipurimycin" *Tetrahedron* **1998**, *54*, 9303
45. Garner, P.; Anderson, J. T.; Dey, S.; Youngs, W. J.; Galat, K. "S-(1-Oxido-2-pyridinyl) 1,1,3,3-tetramethylthiuronium Hexafluorophosphate. A New Reagent for Preparing Hindered Barton Esters" *J. Org. Chem.* **1998**, *63*, 5732
46. Garner, P.; Dey, S.; Huang, Y.; Zhang, X. "Modular Nucleic Acid Surrogates. Solid Phase Synthesis of Alpha-Helical Peptide Nucleic Acids ( $\alpha$ PNAs)" *Organic Letters* **1999**, *1*, 403
47. Garner, P.; Anderson, J. T. "Radical Based Asymmetric Synthesis: An Iterative Approach To 1,3,5...(2n+1) Polyols" *Organic Letters* **1999**, *1*, 1057
48. Dogan, Ö.; Garner, P. P. "Auxiliary Controlled Intramolecular 1,3-dipolar Cycloaddition Reactions of Chiral Azomethine Ylides" *Tr. J. Chem.* **2000**, *24*, 59
49. Garner, P.; Dey, S.; Huang, Y. " $\alpha$ -Helical Peptide Nucleic Acids ( $\alpha$ PNAs): A New Paradigm for DNA-Binding Molecules" *J. Am. Chem. Soc.* **2000**, *122*, 2405
50. Garner, P.; Anderson, J. T.; Turske, R. A. "Asymmetric Diels-Alder Chemistry Based on a New Chiral Auxiliary for 1-Hydroxyl Substituted Dienes" *Chem. Commun.* **2000**, 1579

51. Dey, S.; Garner, P. "Synthesis of *tert*-Butoxycarbonyl (Boc) Protected Purines" *J. Org. Chem.* **2000**, *65*, 7697
52. Garner, P.; Huang, Y.; Dey, S. "Enhancement of  $\alpha$ PNA Binding Affinity and Specificity via Hydrophobic Interactions" *ChemBioChem* **2001**, *2*, 224
53. Garner, P.; Dogan, Ö.; Youngs, W. J.; Kennedy, V. O.; Protasiewicz, J.; Zaniewski, R. "Stereocontrolled 1,3-Dipolar Cycloadditions using Oppolzer's Camphor Sultam as the Chiral Auxiliary for Carboxyl Stabilized Azomethine Ylides" *Tetrahedron*, **2001**, *57*, 71
54. Garner, P.; Sherry, B.; Moilanen, S.; Huang, Y. "In Vitro Stability of  $\alpha$ -Helical Peptide Nucleic Acids ( $\alpha$ PNAs)" *Bioorg. Med. Chem. Lett.*, **2001**, *11*, 2315
55. Garner, P.; Anderson, J. T.; Dey, S. "S-(1-Oxido-2-pyridinyl)-1,1,3,3-tetramethylthiuronium Hexafluorophosphate (HOTT)" *Electronic Encyclopedia of Reagents for Organic Synthesis*
56. Garner, P.; Anderson, J. T.; Cox, P. B.; Klippenstein, S. J.; Leslie, R.; Scardovi, N. "Development of an Effective Chiral Auxiliary for Hydroxyalkyl Radicals" *J. Org. Chem.* **2002**, *67*, 6195
57. Huang, Y.; Dey, S.; Garner, P. "Trimethylsilyl Derivatives of *N*<sup>4</sup>-Boc-Cytosine and I<sub>2</sub>-Mediated Nucleosidation of O-MTM Ethers" *Tetrahedron Lett.* **2003**, *44*, 1441
58. Scardovi, N.; Garner, P. P.; Protasiewicz, J. D. "S-(2-Pyridinyl)-1,1,3,3-Tetramethylthiuronium Hexafluorophosphate. A New Reagent for the Synthesis of 2-Pyridinethiol Esters" *Org. Lett.* **2003**, *5*(10), 1633
59. Garner, P.; Sesenoglu, Ö.; Burgoon, H. "A Camphor-Derived Chiral Auxiliary for Hydroxyalkyl Radicals" *Tetrahedron: Asymmetry* **2003**, *14*(19), 2883 (INVITED)
60. Huang, Y.; Dey, S.; Zhang, X.; Sönnichsen, F.; Garner, P. "The  $\alpha$ -Helical Peptide Nucleic Acid Concept: Merger of Peptide Secondary Structure and Codified Nucleic Acid Recognition." *J. Am. Chem. Soc.* **2004**, *126*, 4696
61. Garner, P.; Sesenoglu, Ö. "3-Fluoro-6-*tert*-Butyltetrahydropyranosyl- $\alpha$ -Trichloroacetamidates. 'Chiral Auxiliary Donors' for Hydroxyalkyl Radicals." *Org. Lett.* **2004**, *6*, 1217
62. Garner, P.; Kaniskan, H. Ü. "A Stereodivergent Cascade Imine  $\rightarrow$  Azomethine Ylide  $\rightarrow$  1,3-Dipolar Cycloadditive Approach to  $\alpha$ -Chiral Pyrrolidines" *Tetrahedron Lett.* **2005**, *46*, 5181

63. Garner, P.; Kaniskan, H. Ü. "Synthesis of Highly Functionalized Pyrrolidines via a Mild One-Pot, Three-Component 1, 3-Dipolar Cycloaddition Process" *J. Org. Chem.* **2005**, *70*, 10868
64. Garner, P.; Sesenoglu, Ö.; Kaniskan, H. Ü. "S-(2-Pyrimidinyl)- and S-(2-(4,6-Dimethylpyrimidinyl))-1,1,3,3-tetramethylthiuronium Hexafluorophosphates: Novel Reagents for *in situ* Peptide Coupling" *Tetrahedron Lett.* **2006**, *47*, 483
65. Garner, P.; Kaniskan, H. Ü.; Hu, J.; Youngs, W. J.; Panzner, M. "Asymmetric Multicomponent [C+NC+CC] Synthesis of Highly Functionalized Pyrrolidines" *Org. Lett.* **2006**, *8*, 3647
66. Dogan, Ö.; Koyuncu, H.; Garner, P.; Bulut, A.; Youngs, W. J.; Panzner, M. "A New Zinc(II)-Based Catalyst for Asymmetric Azomethine Ylide Cycloaddition Reactions" *Org. Lett.* **2006**, *8*, in press

#### INVITED BOOK CHAPTERS

- Garner, P. "Synthetic Approaches to Complex Nucleoside Antibiotics" in *"Studies in Natural Products Chemistry, Vol 1. Stereoselective Synthesis, Part A"*, Atta-Ur-Rahman, Ed.; Elsevier: Amsterdam, 1988
- Garner, P. "Diels-Alder Reactions in Aqueous Media" in *"Organic Synthesis in Water"*, Grieco, P. A., Ed.; Chapman & Hall: London, 1998
- Garner, P.; Dey, S.; Huang, Y. " $\alpha$ -Helical Peptide Nucleic Acid ( $\alpha$ PNA)" in *"Designer Peptides for Drug Development"*, Nielsen, P. E., Ed.; Wiley, 2004

#### PATENTS

- "Peptide-Based Nucleic Acid Surrogates", U.S. Patent No. 5,731,416
- "Helical Nucleopeptides (HNP)", U.S. Patent pending

#### EXTRAMURAL FUNDING HISTORY

- Research Corporation: "A Synthetic Approach to Carzinophilin A", \$12,000 TDC, 11/04/83 - 11/04/85
- NIH (GM35557-01): "The Stereospecific Synthesis of Aminosugar Antibiotics", \$203,532 TDC, 04/01/85 - 03/31/88
- NIH (GM38805-01): "The Asymmetric Synthesis of Bioactive Alkaloids", \$212,876 TDC, 07/01/87 - 06/30/90
- NIH (GM35557-04): "The Stereospecific Synthesis of Aminosugar Antibiotics", \$261,406 TDC, 04/01/89 - 03/31/92

- NIH (GM38805-04): "The Asymmetric Synthesis of Bioactive Alkaloids", \$328,597 TDC, 12/01/92 - 11/30/96
- Biotechnology Research & Development Corporation (BRDC): "Development of Novel Peptide-Based Nucleic Acid Surrogates", \$60,000 TDC, 4/01/94 - 3/31/95
- Ohio Cancer Research Association (OCRA): "The Development of Novel Oligonucleotide Surrogates", \$40,000 TDC, 07/01/94 - 6/30/96
- NSF (CHE-9616632): "Asymmetric Synthesis with Heteroalkyl Radicals", \$345,500 TC, 5/01/97 - 4/30/01
- NIH (GM-54796): "Development of Modular Nucleic Acid Surrogates", \$417,393 TDC, 8/01/97 - 7/31/01
- NSF (CHE-0111831): "Asymmetric Synthesis with Heteroalkyl Radicals", \$390,000 TC, 08/15/01 - 07/31/04
- ACS Petroleum Research Fund (PRF) "Catalytic Asymmetric Azomethine Ylide Cycloaddition Reactions for Alkaloid Synthesis", \$80,000 TC, 06/01/03 - 08/31/06
- NSF (INT-0242964): "Development of Catalytic Asymmetric Azomethine Ylide Cycloaddition Reactions", \$39,480 TC, 2/15/03 - 2/28/06
- NSF (CHE-0553313): "Asymmetric Synthesis of Highly Functional Pyrrolidines", \$405,000 TC, 4/01/06 - 3/31/09
- NSF (Supplement to CHE-0553313 co-funded by OISE): "US-Turkey Collaborative Project", \$40,000 TC, 8/29/06 - 3/31/09
- NIH (GM-079517-01): "Antibiotic Development Cell-Permeable, RNA-Binding Helical Nucleopeptides", \$424,875 TC, 12/01/06 - 11/30/08 (PENDING)
- NIH (GM-080347-01): "Synthesis and Biological Evaluation of Tetrahydroisoquinolines", \$1,108,786 TC, 04/01/07 - 03/31/11 (PENDING)

#### **COLLABORATIVE RESEARCH GRANTS**

- CWRU President's Research Initiative: "Modulation of Gene Expression by Antisense  $\alpha$ -Helical Peptide Nucleic Acids", co-PI with Prof. Ruth Siegel (CWRU-Pharmacology), \$50,000 TDC, 04/15/02 - 03/31/04

#### **SELECTED INVITED LECTURES (1990 on)**

- Garner, P.; Twenty-First Annual NSF Workshop on Organic Synthesis and Natural Products Chemistry (WOSNPC-XXI), July 18-22, 1990, Pingree Park Conference Center, Colorado

- Garner, P. "The Asymmetric Synthesis of DNA-Reactive Alkaloids" The 5th Symposium on the Latest Trends in Organic Synthesis, 10/30-10/4/92, VPI & SU, Blacksburg, VA
- Garner, P.; Dogan, O. "The Development of New Chiral Cycloadditive Synthons for the Asymmetric Synthesis of Amino Acids" Third International Congress on Amino Acids, 8/23-8/27/93, Vienna, Austria
- Garner, P. "A New Class of Chiral Auxiliaries for Asymmetric Radical Reactions", 27th ACS Central Regional Meeting, Akron, Ohio, May 31-June 2, 1995
- Garner, P. "The Development of Effective and Versatile Chiral Auxiliaries for Hydroxyalkyl Radicals", Symposium on "Free Radicals in Organic Synthesis" at the ACS 14th Rocky Mountain Regional Meeting, University of Arizona, March 15-18, 1998
- Garner, P. "A New Approach to 1,3,5...(2n+1) Polyol Synthesis", Gordon Research Conference on Natural Products, July 25-29, 1999
- September 29, 2000 "Alpha-Helical Peptide Nucleic Acids. A New Paradigm for Nucleic Acid Binding Molecules", Department of Chemistry, Cleveland State University
- Garner, P. "Stereocontrolled Polyol Synthesis on a Solid Support via Iterative Radical Homologation", The 9<sup>th</sup> Symposium on the Latest Trends in Organic Synthesis, Gainesville, Florida, October 25-29, 2000
- December 13, 2000 "Alpha-Helical Peptide Nucleic Acids. A New Paradigm for Nucleic Acid Binding Molecules", Department of Chemistry, North Dakota State University
- October 23, 2001 "α-Helical Peptide Nucleic Acid (αPNAs). A New Twist on Nucleic Acid Recognition" Department of Chemistry, Virginia Commonwealth University
- November 29, 2001 "A Novel Approach to 1,3,5...(2n+1) Polyol Synthesis" Department of Chemistry, University of Arizona
- January 22, 2002 "α-Helical Peptide Nucleic Acid (αPNAs). A New Twist on Nucleic Acid Recognition" Department of Chemistry, John Carroll University
- March 14, 2002 "α-Helical Peptide Nucleic Acid (αPNAs). A New Twist on Nucleic Acid Recognition" Department of Chemistry, IRCM Lecture at McGill University
- April 29, 2002 "α-Helical Peptide Nucleic Acid (αPNAs). A New Twist on

*Nucleic Acid Recognition*" Department of Chemistry, University of Toledo

- May 8, 2002 " *$\alpha$ -Helical Peptide Nucleic Acid ( $\alpha$ PNAs). A New Twist on Nucleic Acid Recognition*" Department of Chemistry, University of Connecticut
- October 17, 2002 " *$\alpha$ -Helical Peptide Nucleic Acid ( $\alpha$ PNAs). A New Twist on Nucleic Acid Recognition and Antisense Drug Design*" Institute de Recherches Cliniques de Montréal
- October 22, 2002 " *$\alpha$ -Helical Peptide Nucleic Acid ( $\alpha$ PNAs). A New Twist on Nucleic Acid Recognition and Antisense Drug Design*" Department of Chemistry, University of Florida
- October 28, 2002 " *$\alpha$ -Helical Peptide Nucleic Acid ( $\alpha$ PNAs). A New Twist on Nucleic Acid Recognition and Antisense Drug Design*" Department of Chemistry, University of Georgia
- November 14, 2002 " *$\alpha$ -Helical Peptide Nucleic Acid ( $\alpha$ PNAs). A New Twist on Nucleic Acid Recognition and Antisense Drug Design*" Department of Chemistry, Université de Montréal
- December 2, 2002 " *$\alpha$ -Helical Peptide Nucleic Acid ( $\alpha$ PNAs). A New Twist on Nucleic Acid Recognition and Antisense Drug Design*" Department of Chemistry, Université de Sherbrooke
- February 14, 2003 " *$\alpha$ -Helical Peptide Nucleic Acid ( $\alpha$ PNAs). A New Twist on Nucleic Acid Recognition and Antisense Drug Design*" Department of Chemistry, Hunter College – CUNY
- March 20, 2003 "*The  $\alpha$ -Helical Peptide Nucleic Acid Concept. A New Twist on Antisense Drug Design?*" Department of Chemistry, Edinboro University (PA)
- November 12, 2003 "*The Helical Nucleopeptide Concept. A New Twist on Antisense Drug Design?*" National Institute of Standards and Technology, Washington, DC
- April 27, 2004 "*Helical Nucleopeptides. A New Twist on Antisense Drug Design?*" Department of Chemistry, Rutgers University
- September 10, 2004 "*Studies Directed Towards the Synthesis of Bioxalomycin  $\beta$ 1*" Middle East Technical University, Ankara, Turkey
- September 14, 2004 "*Studies Directed Towards the Synthesis of Bioxalomycin  $\beta$ 1*" University of Vienna, Austria

- May 3, 2005 “*Helical Nucleopeptides. A New Twist on Antisense Drug Design?*” Rammelkamp Research Seminar, Metrohealth Campus
- Garner, P. “*Evolution of the Helical Nucleopeptide Concept. A New Twist on Antisense Drug Design*”, *Frontiers in Peptide Nucleic Acid and Related Technologies*, Carnegie Mellon University, March 24-25, 2006
- April 6, 2006 “*Asymmetric Multicomponent Synthesis of Highly Functionalized Pyrrolidines: A Powerful Tool for the Molecular Architect*” Department of Chemistry, University of Missouri at Kansas City
- Garner, P. “*A Unified Synthetic Approach to the Bioxalomycins and Related Natural (and Unnatural) Products*”, Gordon Research Conference on Natural Products, July 23-28, 2006

### **GARNER GROUP ALUMNI**

Legend: UG = Undergraduate Researcher, MS = Masters Student, PhD = Doctorate Student, RS = Research Scholar, PD = Postdoctoral Research Associate

- Jung Min Park (PhD 1984-89), Ricerca
- Vincent Rotello (UG 1984-85), U Massachusetts at Amherst
- Ramakanth Sarabu (PD 1985-88), Hoffmann-LaRoche
- Shanthi P. Chordia (MS 1985-87), JDP Impex, INDIA
- Wen Bin Ho (PhD 1987-92), Fibrogen
- Sunitha K. Grandhee (PD 1987-88), BASF
- Fariba Aria (PD 1987-89), Kimia Corporation
- Elise Malecki (UG 1987-90), Penn State College of Medicine
- Ji Uk Yoo (PhD 1988-93), Samsung, KOREA
- Satish Pillai (UG 1991-92), Beth Israel Deaconess Medical Center
- Özdemir Dogan (PhD 1991-95), Middle East Technical University, TURKEY
- Philip B. Cox (PD 1993-95), Pfizer
- Ray Leslie (PD 1994-95), Nottingham Trent University, ENGLAND
- Regis Turske (PD 1997-98), Bristol-Myers Squibb
- Xiao Zhang (RS 1998-99)
- Jim Anderson (PhD 1994-99), Wyeth
- Fred Jos (PD 1998-99), Albany Molecular Research
- Subhakar Dey (PhD 1995-00), Applied Biosystems
- Yumei Huang (PhD 1997-02), Ensemble Discovery
- Sirkka Moilanen (UG 1999-01), Cornell University
- Ben Sherry (UG 2001- 02), UC Berkeley – GS in Chemistry
- Michelle Adams (UG 2001- 2003) University of Illinois – GS in Chemistry
- Emine Ozgul-Karaaslan (PD 2002), Kirikkale University, TURKEY
- Noemi Scardovi (RS 2002-2003) University of Bologna
- Nick Hill (UG 2002), Harvard – GS in Chemistry
- Ümit Kaniskan (GS 2002-present)
- Hugh Burgoon (MS 2002-04), Lexicon Genetics
- Özge Sesenoglu (PD 2003-04), Copernicus

- Nathaniel Sears (UG 2003-04), Cleveland Clinic Foundation
- Hasan Koyuncu (RS 2003-06), Middle East Technical University, TURKEY
- Nick Sizemore (UG 2004-05), Aventis
- Jieyu Hu (GS 2004-present)
- Valerie Braz (GS 2005-06)
- Chung Min Park (GS 2005-present)
- Christopher Parker (UG 2005-present)
- Regis Whiteside (UG 2006-present)

#### **PRIMARY TEACHING (1990 on)**

- CHEM 224, Introduction to Organic Chemistry II (1990-94)
- CHEM 435, Synthetic Methods in Organic Chemistry (1990-96, 1998-99, 2003-05)
- CHEM 436, Complex Molecular Synthesis (1996-97, 2004, 2006)
- CHEM 325/425, Methods for Organic Structure Determination (1997-00, 2003)
- CHEM 323, Honors Organic Chemistry I (2000-01)
- CHEM 324, Honors Organic Chemistry II (2001-03)
- CHEM 322, Laboratory Methods and Techniques II (2004-05)
- CHEM 322, Laboratory Methods in Organic Chemistry (2006)

#### **DEPARTMENTAL SERVICE**

- Undergraduate Committee (1985-86)
- Chair, Undergraduate Committee (1986-87)
- Executive Committee (1986-95, 2000-02)
- Organic Faculty Search Committee (1987-88)
- Graduate Recruiting Committee (1987-90, 2000-02)
- Chair, Graduate Recruiting Committee (1990-93)
- Chair, Colloquium Committee (1993-96)
- External Chair Search Committee (1994-95)
- Graduate Committee (1995-00, 2003-06)
- Department Awards Committee (2000-01)
- Department Vision Committee (2003)
- Strategic Planning Exercise Committee (2004-05)
- Chair, Organic Faculty Search Committee (2005-06)

#### **UNIVERSITY SERVICE**

- Baker-Nord Center for the Humanities Advisory Committee (2002-03)
- College of Arts & Sciences Graduate Committee (2005-06)