

## PENG GEORGE WANG

(updated on 8/19/2006)

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### EDUCATION

Ph.D. in Organic/Bioorganic Chemistry, 1990, University of California, Berkeley.  
B.S. in Chemistry, 1984, Nankai University, China.

### EXPERIENCE

9/03- **Professor and Ohio Eminent Scholar in Macromolecular Structure and Function**  
**Professor**, Department of Biochemistry (80% appointment), College of Biological  
Science, The Ohio State University  
**Professor**, Department of Chemistry (20% appointment), College of Science,  
The Ohio State University  
**Joint Professor**, Division of Pharmaceutics, College of Pharmacy, OSU  
The Ohio State University  
**Member**, Dorothy M. Davis Heart & Lung Research Institute, OSU  
**Member**, The Ohio State University Comprehensive Cancer Center (OSUCCC)  
(approval pending)

Research Focus Glycoscience with emphasis on microbial glycobiology and  
glycochemistry, glycomics, glyco-immunology, carbohydrate chemistry and glyco-  
pharmaceutical science. Carbohydrate-based vaccines, drugs and immunotherapy.  
Biosynthetic pathway and enzymology of complex carbohydrate polymers, glycoproteins  
and glycolipids. Biosynthetic pathway engineering of natural products. Structural and  
mechanism-based design and synthesis of inhibitors and ligands. Chemistry and  
biochemistry of reactive nitrogen and oxygen species. Green chemistry.

8/01 -9/03 **Professor** Department of Chemistry, Wayne State University  
**Joint Professor** Barbara Ann Karmanos Cancer Institute, The Detroit  
Medical Center, Wayne State University.  
**Member** Institute for Drug Design, Wayne State University

6/01 – 8/01 **Visiting Professor**, Department of Biochemistry, Osaka University, Japan

8/97 - 8/01 **Associate Professor** (tenured in 1999) Department of Chemistry, Wayne State University

8/94 - 8/97 **Assistant Professor** Department of Chemistry, University of Miami.

2/92 - 8/94 **Postdoctoral Fellow** Scripps Research Institute  
Advisor: Dr. Chi-Huey Wong  
Chemo-enzymatic synthesis of oligosaccharides, glycopeptides and phospholipids.

1/91 - 2/92 **Postdoctoral Fellow** University of California, Berkeley.

Advisor: Dr. Mark D. Bednarski  
Synthesis of C-linked sialic acid and its derivatives for inhibiting the infectivity of influenza virus.

- 5/89 - 12/90 **Graduate Research Assistant**, University of California, Berkeley.  
Research Advisor: Dr. Mark D. Bednarski  
Design, synthesis and synthetic applications of carbohydrate-based polymers.
- 1/87 - 5/89 **Graduate Research Assistant**, University of California, Berkeley.  
Research Advisor: Dr. Andrew Streitwieser  
Equilibrium and kinetic carbon acidities of organic molecules containing second row elements and theoretical computations on phosphorus and silicon compounds.
- 8/85 - 5/89 **Graduate Teaching Assistant**, University of California, Berkeley.

## HONORS

2002 Horace S. Isbell Award from American Chemical Society, Division of Carbohydrate Chemistry  
Co-recipient of the 2000 Presidential Green Chemistry Challenge Award honoring C.-H. Wong  
2000 Metro Detroit's Creator from Crain's Detroit Business  
Career Development Chair Award, Wayne State University, 2000  
Camille Dreyfus Teacher-Scholar Award, 1999  
National Institutes of Health First Independent Research Support and Transition (FIRST) Award (96-01)  
NATO Fellowship from NATO Advanced Study Institute, 1988

## JOURNAL EDITING ACTIVITIES

Member of Editorial Board of *Applied and Environmental Microbiology* (2003-)  
Member of Editorial Board of *Medicinal Research Reviews* (2001- )  
Member of Editorial Board of *Marine Drugs* (2002- )  
Regional Editor, *Current Organic Chemistry* (2002 - )  
Member of Editorial Board of *Carbohydrate Research* (2005 - )

## PROFESSIONAL ACTIVITIES

Executive Councilor of American Chemical Society, Division of Carbohydrate Chemistry  
Reviewer in NIH Centers of Excellence in Chemical Methodologies and Library Development, 2002  
U.S. Department of Energy Catalysis Workshop, May 16-17, 2002  
Ad hoc member in NIH Medicinal Chemistry Study Section (MCHA), June 21-22, 2000  
Participant in NSF-Glyco Science Workshop, May 3-5, 2000  
Ad hoc member in NIH Bioorganic & Natural Products Chemistry Study Section (BNP), 2000  
Reviewer in NIH Special Emphasis Panel, August 19, 1999  
Member of Sylvester Cancer Center, University of Miami School of Medicine, 4/96 - 8/97  
Chairman-Elect of American Chemical Society, South Florida Section, 2/97 - 8/97  
Member of the Patent and Copyright Committee, University of Miami, 6/96 - 6/97

## AFFILIATIONS

American Chemical Society  
American Association for the Advancement of Science  
American Society for Microbiology  
The Society for Glycobiology  
The NITRIC OXIDE Society

## Book edited

Wang, Peng George; Bertozzi, Carolyn R. “Glycochemistry: Principles, Synthesis, and Applications” Marcel Dekker, Inc. New York, **2001**.

Wang, Peng George; Ichikawa, Yoshi. “Synthesis of Carbohydrates Through Biotechnology” ACS Symposium Series for 224<sup>th</sup> American Chemical Society meeting. **2003**.

Wang, Peng George; Cai, Tingwei; Taniguchi, Naoyuki “Nitric Oxide Donors and Their Applications” Wiley-VCH, **2004**.

## Patents

1. Cheng, H. N.; Nickol, R. G.; Wang, P. G.; Li, J. “**Galactosylated Hydroxylalkyl Polysaccharides**” (Hercules Inc., USA; University of Miami) US Patent 6,433,161 B1. August 13, **2002**.
2. Wang, P. G.; Xie, W.-H.; Qiao, L.; Nickol, R. G.; Cheng, H.N. “**ACETOACETYLATED SACCHARIDES AND PROCESS OF MAKING THE SAME**” US Patent 6,528,644 B1. March 4, **2003**.
3. Wang, Peng George; Xie, Wenhua; Qiao, Lei; Cheng, Huai N.; Murphy, Dennis J.; Gu, Qu-ming. “**Oxime-linked polysaccharides and methods of preparing the same**” US Patent 6,846,923. January 25, **2005**.
4. Wang, Peng George; Wu, Xuejun; Tang, Xiaoping “**Enzyme Activated Nitric Oxide Donors**” US Patent 6,867,194 B2. March 15, **2005**.

## Patent Applications

1. Cheng, H. N.; Nickol, R. G.; Wang, P. G.; Li, J. “**Galactosylated Hydroxylalkyl Polysaccharides and Their Derivatives**” (Hercules Inc., USA; University of Miami) WO 98/49201. Publication date: 5 November 1998.
2. Wang, Peng George; Xie, Wenhua; Qiao, Lei; Nickol, Robert G.; Cheng, Huai N. **Preparation of acetoacetylated saccharides via enzymic ring cleavage-esterification reaction with diketene**. U.S. (2003), 6 pp. CODEN: USXXAM US 6528644 B1 20030304.

## **Current research support:**

*Title: "Uncommon Sugars and Their Glycosylation"*

Principal Investigator: Peng George Wang, Ph.D.

Agency: NSF CHE-0616892

Period: 08/01/2006 - 07/31/2009

Funding: \$140,000/year (total cost)

The major objective is to synthesize several types of deoxysugars and conjugate them onto important pharmaceuticals

*Title: "Chemistry and Biochemistry of Nitric Oxide Releasing Agents"*

Principal Investigator: Peng George Wang, Ph.D.

Agency: NIGMS R01 (GM54074, years 6-8) Period: 01/01/03 - 12/31/05; no cost extension 01/01/06-12/31/06

Funding: \$175,000/year (direct cost)

The major objective is to rationally design and synthesize a variety of nitric oxide (NO) releasing agents, and to investigate the interaction of these compounds with proteins. Competing renewal will be submitted on November 1<sup>st</sup>, 2006.

*Title: "Chemical Glycobiology on Anthracyclines"*

Principal Investigator: Peng George Wang, Ph.D.

CO-PI: Professors Duxin Sun, Robert Snapka, Christopher Hadad from the Ohio State University

Agency: NIH-NCI 1R01CA118208 Period: 07/01/06 - 10/31/10 (4% percentile from SBCA study section)

Funding: \$175,000/year (direct cost)

The program investigates the interaction and selectivity of designed anthracyclines in DNA-drug complex (as in the first step of drug action) and in Topoisomerase-DNA-drug complex (as in the next step of drug action). The program will focus on three closely related and synergistic aims: (1) Establishment of a platform for molecular modeling and screening of anthracycline drugs; (2) Synthesis of di- or trisaccharide anthracyclines; (3) Biological and mechanistic investigation of the new synthetic anthracyclines. In summary, this program combines molecular modeling and experimental validation to develop a new approach for designing carbohydrate-modified anthracyclines.

*Title: "NKT Cells Immunotherapy: Targeting Dendritic Cells with Glycolipid Liposomes"*

Principal Investigator: Peng George Wang, Ph.D.

CO-PI: Professor Robert Lee from the Ohio State University

Agency: NIH-NCI R21CA123195 Period: 08/01/06 - 07/31/08 (10% percentile from DMP study section)

Funding: \$275,000 (total direct cost)

This research program combines expertise from three different laboratories at The Ohio State University and an industry partner to work on the first proof of concept for liposomal glycolipid drug delivery to dendritic cells for better harnessing the wide range of immunological functions of natural killer T cells. This program includes four specific aims: (1) Synthesis of Le<sup>a</sup> and Le<sup>x</sup> oligosaccharides, their tetramers and their conjugates with lipids; (2) Production of two liposomal systems. System A consists of  $\alpha$ -GalCer with anti-DC-SIGN antibody displayed; system B consists of  $\alpha$ -GalCer with fucosylated oligosaccharide displayed (e.g Le<sup>a</sup> and Le<sup>x</sup>); (3) Investigation *in vitro* of the two liposomal systems for their targeting and cytotoxicity; (4) Investigation *in vivo* of the two liposomal systems for their antitumor effects in mouse models.

## **Pending NIH proposal**

1. "Polysaccharides Biosynthetic Pathway and Mechanism", 1R01GM077405-01A1,

PI: Peng George Wang; 48% percentile from MSFB study section in June 2006.

2. "Synthesis and bioactivities of glycosphingolipid antigens for NKT cells", 1R01GM079658-01

PI: Peng George Wang; 37% percentile from SBCA study section in June 2006.

## PUBLICATION LIST

### Papers published

1. Rajca, A.; Wang, P.; Streitwieser, A.; Schleyer, P. v. R., Unusual Structures of Dilithiosilanes and Disodiosilanes. Ionicity of the Silicon-Alkali-Metal Bond. *Inorg. Chem.* **1989**, 28, 3064-3070.
2. Wang, P.; Agrafiotis, D. K.; Streitwieser, A.; Schleyer, P. v. R., Berry and Turnstyle Processes in the Pseudorotation of Three Phosphoranes. *J. Chem. Soc., Chem. Commun.* **1990**, 201-203.
3. Wang, P.; Hill, T. G.; Bednarski, M. D.; Callstrom, M. R., The Use of Carbohydrate Protein Conjugates of Proteases [CPC(Proteases)] for the Catalytic Formation of Peptide Bonds. *Mater. Res. Soc. Symp. Proc.* **1991**, 23-30.
4. Wang, P.; Hill, T. G.; Bednarski, M. D.; Callstrom, M. R., The Catalytic Formation of Peptide Bonds with Carbohydrate Protein Conjugates of Proteases [CPC(Proteases)]. *Tetrahedron Lett.* **1991**, 32, 6827-6830.
5. Wang, P.; Zhang, Y.; Glaser, R.; Reed, A. E.; Schleyer, P. v. R.; Streitwieser, A., The Effects of the First and Second Row Substituents on the Structures and Energies of PH<sub>4</sub>X Phosphoranes. An Ab Initio Study. *J. Am. Chem. Soc.* **1991**, 113, 55-64.
6. Hill, T. G.; Wang, P.; Oehler, L. M.; Huston, M. E.; Wartchow, C. A.; Smith, M. B.; Bednarski, M. D.; Callstrom, M. R., Carbohydrate Protein Conjugates (CPC): The Design of New Materials to Stabilize Enzymes. *Tetrahedron Lett.* **1991**, 32, 6823-6826.
7. Wang, P.; Hill, T. G.; Wartchow, C. A.; Huston, M. E.; Oehler, L. M.; Smith, M. B.; Bednarski, M. D.; Callstrom, M. R., The Preparation of New Carbohydrate-Based Materials for the Stabilization of Proteins. *J. Am. Chem. Soc.* **1992**, 114, 378-380.
8. Nagy, J. O.; Wang, P.; Gilbert, J. H.; Schaefer, M. E.; Hill, T. G.; Callstrom, M. R.; Bednarski, M. D., Carbohydrate materials bearing neuraminidase-resistant C-glycosides of sialic acid strongly inhibit the in vitro infectivity of influenza virus. *J Med Chem* **1992**, 35, (23), 4501-2.
9. Callstrom, M. R.; Hill, T. G.; Wartchow, C. A.; Huston, M. E.; Smith, M. B.; Bednarski, M. D.; Oehler, L. M.; Wang, P., The Synthesis of New Carbohydrate-Based Materials and Their Use for the Stabilization of Proteins. *Harnessing Biotechnol. 21st Century* **1992**, 63-67.
10. Streitwieser, A.; Xie, L.; Wang, P.; Bachrach, S. M., Ion Pair Carbon Acidities of Some Silanes in Tetrahydrofuran. *J. Org. Chem.* **1993**, 58, 1778-1784.
11. Wang, P.; Zhang, Y.; Glasser, R.; Streitwieser, A.; Schleyer, P. v. R., Ab Initio Calculations on Phosphorus Compounds. II. Effects of Disubstitution on Ligand Apicophilicity in Phosphoranes. *J. Comput. Chem.* **1993**, 14, 522-529.
12. Wong, C.-H.; Schuster, M.; Wang, P.; Sears, P., Enzymatic Synthesis of N- and O-Linked Glycopeptides. *J. Am. Chem. Soc.* **1993**, 115, 5893-5901.
13. Wang, P.; Shen, G.-J.; Wang, Y.-F.; Ichikawa, Y.; Wong, C.-H., Enzymes in Oligosaccharide Synthesis: Active-Domain Overproduction, Specificity Study and Synthetic Use of an  $\alpha$ 1,2-Mannosyltransferase with Regeneration of GDP-Man. *J. Org. Chem.* **1993**, 58, 3985-3990.

14. Wang, P.; Schuster, M.; Wang, Y.-F.; Wong, C.-H., Synthesis of Phospholipid-Inhibitor Conjugates by Enzymatic Transphosphatidylation with Phospholipase D. *J. Am. Chem. Soc.* **1993**, 115, 10487-10491.
15. Ichikawa, Y.; Look, G. C.; Shen, G. J.; Sears, P.; Wang, P.; Wong, C.-H., Recent Developments in Enzymatic Synthesis of Oligosaccharides and Glycopeptides. *Carbohydrates and Carbohydrate Polymers* **1993**, 1-16.
16. Herrman, G. F.; Wang, P.; Shen, G.-J.; Garcia-Junceda, E.; Chen, S.; Khan, S.; H.; Matta, K. L.; Wong, C.-H., Large Scale Overexpression of Recombinant  $\alpha$ -1,2-Mannosyltransferase in E. Coli. for the Study of Acceptor Specificity and Use of the Recombinant Whole Cells in Synthesis. *J. Org. Chem.* **1994**, 59, 6356-6362.
17. Sears, P. S.; Schuster, M.; Wang, P.; Wong, C.-H., Engineering Subtilisin for Peptide Coupling. *J. Am. Chem. Soc.* **1994**, 116, 6521-6530.
18. Herrmann, G. F.; Wang, P.; Shen, G.-J.; Wong, C.-H., Recombinant Whole Cells As Catalysts For the Enzymatic Synthesis of Oligosaccharides and Glycopeptides. *Angew. Chem., Int. Ed. Engl.* **1994**, 33, 1241-1242.
19. Schuster, M.; Wang, P.; Paulson, J. C.; Wong, C.-H., Solid Phase Enzymatic Synthesis of Glycopeptides and Oligosaccharides. *J. Am. Chem. Soc.* **1994**, 116, 1135-1136.
20. Wartchow, C. A.; Wang, P.; Bednarski, M. D.; Callstrom, M. R., Carbohydrate Protease Conjugates: Stabilized Proteases for Peptide Synthesis. *J. Org. Chem.* **1995**, 60, 2216-2226.
21. Yu, L.-B.; McGill, A.; Ramirez, J.; Wang, P. G.; Zhang, Z.-Y., Synthesis and Bioassay of a Protein Tyrosine Phosphatase Inhibitor, Dephostatin. *Bioorg. Med. Chem. Lett.* **1995**, 5, 1003-1006.
22. Yu, L.-B.; Cabrera, R.; Ramirez, J.; Malinovskii, V. A.; Brew, K.; Wang, P. G., Chemical and Enzymatic Synthesis of Glycoconjugates 1. Enzymatic Galactosylation of Conduritol B. *Tetrahedron Lett.* **1995**, 36, 2897-2900.
23. Wang, P. G.; Fitz, W.; Wong, C.-H., Making Complex Carbohydrates via Enzymatic Routes. *Chemtech* **1995**.
24. Stratakis, M.; Wang, P. G.; Streitwieser, A., Equilibrium Ion Pair Acidities of Polyhalogenated Benzenes in THF. Extrapolation to Benzene. *J. Org. Chem.* **1996**, 61, 3145-3150.
25. Wang, P. G.; Echegoyen, L.; McGill, A.; Yang, Y.-F.; Li, J.; Yu, L.-B., N-Hydroxyl-N-nitrosamines, redox-sensitive nitric oxide donors. *The Biology of Nitric Oxide* **1996**, 5, 190.
26. Guo, Z.-M.; McGill, A.; Yu, L.-B.; Li, J.; Ramirez, J.; Wang, P. G., S-Nitrosylation of Proteins by N-Alkyl-N-Nitrosoanilines. *Bioorg. Med. Chem. Lett.* **1996**, 6, 573-578.
27. Wang, P. G.; Guo, Z.-M.; McGill, A.; Yu, L.-B.; Li, J.; Ramirez, J., Substituted N-Methyl-N-Nitrosoanilines Are A Novel Class of Protein S-Nitrosation Agents. *The Biology of Nitric Oxide* **1996**, 5, 180.

28. Chen, D.-P.; Yu, L.-B.; Wang, P. G., Lewis Acid-Catalyzed Reactions in Protic Media. Lanthanide-Catalyzed Reactions of Indoles with Aldehydes or Ketones. *Tetrahedron Lett.* **1996**, 37, 4467-4470.
29. Yu, L.-B.; Chen, D.-P.; Wang, P. G., Aqueous Aza-Diels-Alder Reactions Catalyzed by Lanthanide Trifluoromethanesulfonates. *Tetrahedron Lett.* **1996**, 37, 2169-2172.
30. Hou, Y.-C.; Guo, Z.-M.; Li, J.; Wang, P. G., Seleno Compounds and Glutathione Peroxidase Catalyzed Decomposition of S-Nitrosothiols. *Biochem. Biophys. Res. Commun.* **1996**, 228, 88-93.
31. Ramirez, J.; Yu, L.-B.; Li, J.; Brauschweiger, P. G.; Wang, P. G., Glyco-S-Nitrosothiols, A Novel Class of NO Donor Compounds. *Bioorg. Med. Chem. Lett.* **1996**, 6, 2575-2580.
32. Streitwieser, A.; Wang, P. G.; Bors, D. A., Equilibrium Acidities of Some Sulfones and Sulfoxides in Tetrahydrofuran. *Tetrahedron* **1997**, 53, 10103-10112.
33. Xie, W.-H.; Li, J.; Chen, D.-P.; Wang, P. G., Ring-Opening Polymerization of beta-Butyrolactone by Thermophilic Lipases. *Polym. Prepr.* **1997**, 38, 279-280.
34. Wang, S.-P.; Li, Y.; Shao, L.; Ramirez, J.; Wang, P. G.; Leblanc, R. M., Excess Free Energies of Interaction Between 10,12-Pentacosadiynoic Acid (PDA) and its Mannoside Derivative (MPDA). A Mixed-Monolayer Study. *Langmuir* **1997**, 13, 1677-1681.
35. Yu, L.-B.; Chen, D.-P.; Li, J.; Ramirez, J.; Wang, P. G., Lanthanide-Catalyzed Reactions of Aldehydes and Amine Hydrochlorides in Aqueous Solution. Synthesis of 2, 3-Dihydropyridinium and Pyridinium Derivatives. *J. Org. Chem.* **1997**, 62, 208-211.
36. Yu, L.-B.; Chen, D.-P.; Li, J.; Wang, P. G., Preparation, Characterization and Synthetic Uses of Lanthanide(III) Catalysts Supported on Ion Exchange Resins. *J. Org. Chem.* **1997**, 62, 3575-3581.
37. Yu, L.-B.; Li, J.; Ramirez, J.; Chen, D.-P.; Wang, P. G., Synthesis of azasugars via Lanthanide-Promoted Aza Diels-Alder Reactions in Aqueous Solution. *J. Org. Chem.* **1997**, 62, 903-907.
38. Xie, W.-H.; Li, J.; Chen, D.-P.; Wang, P. G., Ring-opening polymerization of b-butyrolactone by thermophilic lipases. *Macromolecules* **1997**, 30, 6997-6998.
39. Li, J.; Wang, P. G., Chemical and Enzymatic Synthesis of Glycoconjugates 2. High Yielding Regioselective Synthesis of N-Acetylactosamine by Use of Recombinant Thermophilic Glycosidases Library. *Tetrahedron Lett.* **1997**, 38, 7967-7970.
40. Guo, Z.; Wang, P. G., Utilization of glycosyltransferases to change oligosaccharide structures. *Appl Biochem Biotechnol* **1997**, 68, (1-2), 1-20.
41. Fang, J.-W.; Xie, W.-H.; Li, J.; Wang, P. G., Chemical and Enzymatic Synthesis of Glycoconjugates 3. Synthesis of Lactosamine by Thermophilic Galactosidase Catalyzed Galactosylation on a Multigram Scale. *Tetrahedron Lett.* **1998**, 39, 919-922.
42. Wang, J.-Q.; Archer, C.; Li, J.; Wang, P. G., Thermophilic Esterase/Lipases as an Effective Tool for the Resolution of Nucleoside Diastereoisomers: Convenient One-pot Synthesis of a-L-Taluronamide and b-D-Alluronamide Nucleosides. *J. Org. Chem.* **1998**, 63, 4850-4853.

43. Guo, Z.-M.; Ramirez, J.; Li, J.; Wang, P. G., Peptidyl N-Nitrosoaniline: A Novel Class of Cysteine Protease Inactivator. *J. Am. Chem. Soc.* **1998**, 120, 3726-3734.
44. Fang, J.-W.; Li, J.; Chen, X.; Zhang, Y.-N.; Wang, J.-Q.; Guo, Z.-M.; Brew, K.; Wang, P. G., A Highly Efficient Chemo-Enzymatic Synthesis of  $\alpha$ -Galactosyl Epitopes with a Recombinant  $\alpha$ 1,3-Galactosyltransferase. *J. Am. Chem. Soc.* **1998**, 120, 6635-6638.
45. Martin, J.; Jaramillo, L. M.; Wang, P. G., Efficient Synthesis of  $\alpha$ -Aldopyranosyl Cyanides via Radical Cyanation Reactions. *Tetrahedron Lett.* **1998**, 39, 5927-5930.
46. Cheng, J.-P.; Xian, M.; Wang, K.; Zhu, X.-Q.; Yin, Z.; Wang, P. G., Heterolytic and Homolytic Y-NO Bond Energy Scales of Nitroso-Containing Compounds: the Chemical Origin of NO Release and NO Capture. *J. Am. Chem. Soc.* **1998**, 120, 10266-10267.
47. Hou, Y.; Wang, J.; Arias, F.; Echegoyen, L.; Wang, P. G., Electrochemical studies of S-nitrosothiols. *Bioorg Med Chem Lett* **1998**, 8, (21), 3065-70.
48. Li, J.; Robertson, D. E.; Short, J. M.; Wang, P. G., Chemical and Enzymatic Synthesis of Glycoconjugates 4. Control of Regioselectivity in High Yielding Synthesis of (b-D-Fucopyranosyl)-O-D-xylopyranosyl Disaccharide Derivatives Using a CLONEZYME Thermophilic Glycosidase. *Tetrahedron Lett.* **1998**, 39, 8963-8966.
49. Xie, W.-H.; Yu, L.-B.; Chen, D.-P.; Li, J.; Ramirez, J.; Wang, P. G., Lanthanide-Catalyzed Organic Synthesis in Protic Solvents. *Environmentally Benign Chemistry/Green Chemistry* **1998**, 129-149.
50. Guo, Z.; Miranda, N.; Wang, P. G., Protein S-nitrosating agents. *Methods Enzymol* **1999**, 301, 249-58.
51. Hou, Y.; Wang, J. Q.; Ramirez, J.; Wang, P. G., Glyco-S-nitrosothiols: sugar-SNAP, a new type of nitric oxide donor. *Methods Enzymol* **1999**, 301, 242-9.
52. McGill, A. D.; Yang, Y.-F.; Echegoyen, L.; Wang, P. G., Redox-Sensitive Nitric Oxide Donors: Nitric Oxide Generation Through Electrolysis. *Methods in Enzymology, Nitric Oxide, Part C: Biological and Antioxidant Activities* **1999**, 301, 235-242.
53. Li, J.; Robertson, D. E.; Short, J. M.; Wang, P. G., Chemical and Enzymatic Synthesis of Glycoconjugates 5. One-pot Regioselective Synthesis of Bioactive Galactobiosides Using a Clonezyme Thermophilic Glycosidase Library. *Bioorg. Med. Chem. Lett.* **1999**, 9, 35-38.
54. Li, J.; Ksebati, M. B.; Zhang, W.; Guo, Z.-M.; Wang, J.-Q.; Yu, L.-Y.; Fang, J.-W.; Wang, P. G., Conformational Analysis of an  $\alpha$ -Galactosyl Trisaccharide Epitope Involved in the Hyperacute Rejection Upon Xenotransplantation. *Carbohydr. Res.* **1999**, 315, 76-88.
55. Li, J.; Cheng, H. N.; Nickol, R. G.; Wang, P. G., Enzymatic Modification of Hydroxyethyl Cellulose by Transgalactosylation with  $\beta$ -Galactosidase. *Carbohydr. Res.* **1999**, 316, 133-137.
56. Li, J.; Xie, W.-H.; Cheng, H. N.; Nickol, R. G.; Wang, P. G., Polycaprolactone-modified Hydroxyethyl Cellulose Films Prepared by Lipase-Catalyzed Ring-Opening Polymerization. *Macromolecule* **1999**, 32, 2789-2792.



57. Li, J.; Zacharek, S.; Chen, X.; Wang, J.-Q.; Zhang, W.; Janczuk, A.; Wang, P. G., Bacteria Targeted by Human Natural Antibodies Using  $\alpha$ -Gal Conjugated Receptor-Specific Glycopolymers. *Bioorg. Med. Chem.* **1999**, 7, 1549-1558.
58. Xie, W.-H.; Bloomfield, K. M.; Jin, Y.-F.; Dolney, N. Y.; Wang, P. G., Lanthanide Triflates Catalyzed Reactions of Imines with Indole in Protic Media. *Synlett* **1999**, 4, 498-500.
59. Chen, Y.-S.; Heeg, M.; Braunschweiger, P. G.; Xie, W.-H.; Wang, P. G., Synthesis and Crystal Structure of a Novel Carbohydrate-Linked Cisplatin Analog Having Antitumor Activity. *Angew. Chem. Int. Ed.* **1999**, 38, 1768-1769.
60. Xie, W.-H.; Heeg, M. J.; Wang, P. G., Formation and Crystal Structure of a Polymeric La(H<sub>2</sub>Salen) Complex. *Inorg. Chem.* **1999**, 38, 2541-2543.
61. Fang, J.-W.; Chen, X.; Zhang, W.; Wang, J.-Q.; Andreana, P.; Wang, P. G., Chemoenzymatic Synthesis of  $\alpha$ -Gal Epitope Derivatives Containing Free Amino Groups: Efficient Separation and Further Manipulation. *J. Org. Chem.* **1999**, 64, 4089-4094.
62. Xie, W.-H.; Chen, D.-P.; Fan, X.-H.; Li, J.; Wang, P. G., Lithium Chloride as Catalyst for Ring-Opening Polymerization of Lactide. *J. Polymer Sci.* **1999**, 37, 3486-3491.
63. Zhang, W.; Wang, J.-Q.; Li, J.; Yu, L.-B.; Wang, P. G., A Large-Scale Synthesis of an  $\alpha$ -Galactosyl Trisaccharide Epitope Involved in the Hyperacute Rejection Upon Xenotransplantation. *J. Carbohydr. Chem.* **1999**, 18, 1009-1017.
64. Hou, Y.; Wang, J.; Andreana, P. R.; Cantauria, G.; Tarasia, S.; Sharp, L.; Braunschweiger, P. G.; Wang, P. G., Targeting nitric oxide to cancer cells: cytotoxicity studies of glyco-S-nitrosothiols. *Bioorg Med Chem Lett* **1999**, 9, (15), 2255-8.
65. Wang, S.-P.; Ramirez, J.; Chen, Y.-S.; Wang, P. G.; Leblanc, R. M., Surface Chemistry, Topography, and Spectroscopy of a Mixed Monolayer of 10,12-Pentacosadiynoic Acid and Its Mannoside Derivative at the Air-Water Interface. *Langmuir* **1999**, 15, 5623-5629.
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## **Invited seminars or lectures**

91. Invited speaker on “Biomedical Application of Nitric Oxide Donor Compounds” at Hart & Lung Research Institute at The Ohio State University, November 9, 2005.
90. Invited speaker on “Biosynthesis of Polysaccharides”, in First Annual UK-Southeast USA Symposium on Structural Genomics and Proteomics of Membrane and Metalloproteins at University, Athens, October, 14, 2005.
89. Invited speaker on “Glycopharmaceuticals: from small molecules to polymers”, Department of Chemistry, Washington State University, August, 22, 2005.
88. Invited speaker on “Glycopharmaceuticals: from small molecules to polymers” in Consortium for Functional Glycomics Participating Investigator Meeting, May 17-18, 2005, Bethesda, Maryland, USA.
87. Invited speaker on “A Spoon of Sugar Makes the Medicine Go Down”, in Division of Pharmaceutics, College of Pharmacy, The Ohio State University, Columbus, Ohio, April 4, 2005.
85. Invited speaker on “Uncommon Sugars and Their Conjugates to Natural Products” in ACS Meeting San Diego, March 13, 2005.
86. Invited speaker on “How Sweet It is, Hooked on Sugar” as a representative for the College of Biological Science in Winter College 2005, sponsored by The Ohio State University, Florida, February 18, 2005.
85. Invited speaker on “Weigh sugar molecules on a surface with Quartz Crystal Microbalance: Glyconanoengineering and Glycosurfaceengineering” Department of Physics, Biophysics Seminar Series, at The Ohio State University, January 26, 2005.
84. Poster on “Biosynthetic Gene Cluster Sequences and Mechanism of Action of *E. coli* O-Antigens”, Annual Meeting of Glycobiology Society, Hawaii, USA, November 12-16, 2004.
83. Invited speaker on “Glycochemistry and Glycopharmaceuticals” in University of New Orleans, Department of Chemistry, November 12, 2004.
82. Invited speaker on “Biosynthesis of Polysaccharides” in University of Iowa, Department of Medicinal Chemistry, College of Pharmacy, November 2, 2004.
81. Invited speaker on “Glycopharmaceuticals” in The First International Symposium on Marine Drugs (ISMD2004), October 18-22, Qingdao, China.
82. Invited speaker on “Enzymatic Synthesis of Oligosaccharides” in The First International Forum on Homogeneous Catalysis and the Third Sino-Dutch Bilateral Symposium on Catalysis in Hangzhou, China, October 11-12, 2004.
81. Invited speaker on “How Sweet It Is? Hooked on Sugar” for The Ohio State University Colleges of the Arts and Sciences, Renaissance Rediscovery October 7 - 9, 2004

80. Invited speaker on “Glycochemistry and Glycobiology” in Southern Illinois University Edwardsville in Department of Chemistry and Biochemistry, September 28, 2004, Illinois, USA.
79. Invited speaker on “Glycochemistry and Glycopharmaceuticals” in University of Missouri at St. Louis in Department of Chemistry and Biochemistry, September 27, 2004, Missouri, USA.
78. Invited speaker on “Glycopharmaceuticals” in University of Minnesota Department of Medicinal Chemistry, September 12, 2004, Minnesota, USA.
77. Invited speaker on “Glycopharmaceuticals” in 2004 International Symposium on Chiral Synthesis and Drug Design, August 15-19, Tianjin, China.
76. Lecturer on “Applications of QCM and ITC in Glycobiology” for Biophysics Program, The Ohio State University, July 22, 2004.
75. Invited speaker on “Surfing along the wave of glycoscience”, Undergraduate Mix, Department of Biochemistry, The Ohio State University, June 3<sup>rd</sup>, 2004.
74. Invited speaker on “Conjugates of Sugar to Reactive Nitrogen Species as Research Probes”, Third International Conference on the Biology, Chemistry, and Therapeutic Applications of Nitric Oxide, May 24-28, 2004, Nara, Japan.
73. Invited speaker on “Carbohydrate Production and Microbial Glycobiology” Senri Life Science Seminar on A bridge between functional analyses of sugar chains to glycodrugs, February 27, 2004, Osaka, Japan.
72. Invited speaker on “Technology Platforms for Production of Oligosaccharides and Basic Research on Bacterial Polysaccharides on Human Natural Immunity” Boston Glycobiology Discussion Group, February 18, 2004, Boston, USA.
71. Invited speaker on “NOS Substrates & NO Donors”, Mesilla 2004 The Chemistry of NO in Biological Signaling, February 1-4, New Mexico, 2004, USA.
70. “Molecular Characterization of *Escherichia Coli* O86:B7 Antigen Biosynthesis Gene Cluster” Glycobiology 2003, San Diego, CA, December 6 & 7, 2003
69. “Glycoengineering: Making glycoconjugates available for R&D” Enzyme Engineering XVII, Invited Speaker, Santa Fe, New Mexico, November 9-14, 2003
68. “Bacterial Polysaccharides and Their Relation to Human Immunity” Center for Microbial Interface Biology (CMIB), The Ohio State University School of Medicine, Columbus, October 13, 2003.
67. “Synthesis of Glycoconjugate Through Biosynthetic Pathway Engineering” ACS meeting at New York, Sept. 7 – 12, 2003
66. “Production of Biochemicals and Pharmaceuticals through Biotechnology” The Second Worldwide Chinese High-Tech Chemistry Conference, Invited Speaker, Chengdu, China, August 16-20, 2003

65. "Synthesis of glycoconjugates through biosynthetic pathway engineering" European Conference on Carbohydrates, Invited Speaker, Grenoble, France, July 11, 2003
64. "Following Biosynthetic Pathways to Make Oligosaccharides and Carbohydrate Vaccines", Gordon Conference, Invited Speaker, Tilton, NH, June 24, 2003
63. "Synthesis of Glycoconjugate Through Biosynthetic Pathway Engineering" RSC carbohydrate Group Spring Meeting, Invited Speaker, Gatwick, England, April 9-11, 2003
62. "Chemistry and Biochemistry of Nitric Oxide Donors" Gordon Conference, Invited Speaker, Ventura, CA, February 9-14, 2003
61. "Enhanced inhibition of human anti-Gal antibody binding to mammalian cells by synthetic alpha-Gal epitope polymers" 224th ACS National Meeting, Boston, August 22, 2002.
60. "Synthesis of glycoconjugates through biosynthetic pathway engineering" In a symposium organized by P. G. Wang in ACS National Meeting, Boston, August 19, 2002.
59. "Carbohydrates in Human Immunity" 2002 Isbell Award lecture in Isbell-Wolfrom.Symposium, ACS National Meeting, Boston, August 18, 2002.
58. "Synthesis of Glycoconjugates through Biotechnology: Superbeads and Superbug" XXIst International Carbohydrate Symposium, Cairns, Australia, July 11, 2002.
57. "Glycotechnology in Biomedical Research" Center for Medical Glycobiology, University of Oklahoma Health Sciences Center, Oklahoma City, May 28, 2002
56. "Green Chemistry", Department of Chemistry, Tulane University, April 4, 2002
55. "Glycotechnology in Biomedical Research" Department of Medicinal Chemistry, University of Michigan, Ann Arbor, March 14, 2002.
54. "Glycotechnology: A Combination of Synthesis, Biochemistry and Biotechnology" Department of Chemistry, University of California, Berkeley, February 26, 2002.
53. "Glycotechnology: Production of Sugar Products by Bioengineering" Lecture for Pharmaceutical Engineering Program, University of Michigan at Ann Arbor, February 19, 2002.
52. "Synthesis of Glycoconjugates through Biotechnology" Glycomics seminar/course sequence, Department of Chemistry, MIT, February 12, 2002
51. "Chemistry and Biochemistry of Nitric Oxide Donors" Department of Chemistry, Queens' University, Kingston, Canada, January 23, 2002.
50. "Glycotechnology: How Sweet a Sugar Sequence in the Hands of Synthetic Organic Chemists" Department of Chemistry, Michigan State University, November 28, 2001.
49. "Large-Scale production of Oligosaccharides Through Superbug and Superbeads" Annual Conference of the Society for Glycobiology, San Francisco, November 16, 2001.
48. "Large-Scale Synthesis of Glycoconjugates Through Biotechnology" Satellite Symposium on Commercial Production and Biology of Synthetic and Recombinant Glycoconjugates San Francisco, November 14, 2001.
47. "The critical sugar sequence and its glycobiology in the process of animal to human transplantation (xenotransplantation)", Department of Biological Chemistry, University of Michigan, Ann Arbor, October, 23, 2001.

46. "Superbug and superbeads: recent development on glycototechnology" The Institute of Physical and Chemical Research (RIKEN), Tokyo, Japan, July, 27, 2001.
45. "Transferring basic biosynthetic pathway into glycototechnology" Mitsubishi Kasei Institute of Life Sciences, Tokyo, Japan, July, 26, 2001.
44. "Production of Carbohydrates through Bioengineering" Biomolecular Engineering Research Institute, Osaka, Japan, July 18, 2001.
43. "Synthesis of glycoconjugates through biotechnology" Department of Chemistry, Massachusetts Institute of Technology (MIT), Boston, June 26, 2001.
42. "Superbug and Superbeads: follows nature's way to produce natural products" American Chemical Society 30th Northeast Regional Meeting (NERM), Durham, NH, June 25, 2001.
41. "Superbug and Superbeads: follows nature's way to produce natural products" Gordon Research Conference: Bioorganic Chemistry, June 19, 2001.
40. Symposium Organizer for "Production of Pharmaceuticals Through Biotechnology, Post Genomic Development" at ACS 33rd Central/Great Lakes Joint Regional Meeting, Grand Rapids, MI, June 13, 2001. Speaker "Synthesis and Modification of Carbohydrates through Biotechnology"
39. "Glycochemistry and Glycobiology on alpha-Gal Sugar Apitopes" Department of Chemistry, Duke University, April, 13, 2001.
38. "Bio-organic Research Programs at Wang's laboratory" Department of Chemistry, Youngstown State University, Ohio, March 23, 2001.
37. "Production of oligosaccharides with Superbug and superbeads technology" School of Pharmacy, The University of North Carolina at Chapel Hill, March 22, 2001.
36. "Using Superbug and Superbeads to produce natural products" Department of Chemical Engineering, Virginia Commonwealth University, March 16, 2001.
35. "Superbug and Superbeads: following nature's way to produce natural products" Department of Chemistry and Biochemistry, Brigham Young University, February 22, 2001.
34. "Superbug and Superbeads: following nature's way to produce natural products" Department of Chemistry and Biochemistry, Utah State University, February 21, 2001.
33. "Synthesis and Biomedical Applications of Carbohydrates" Department of Chemistry, North Carolina State University, November 10, 2000.
32. "Synthesis and Modification of Carbohydrates through Biotechnology" at the ACS Symposium "Envio-compatible Synthesis and Process: Targeting Sustainability" Washington D.C. August 24, 2000.
31. "Nitric Oxide Donors: Chemistry and Biochemistry" Cayman Chemical Inc. Ann Arbor, Michigan, March 7, 2000.
30. "Basic Research in Xenotransplantation and on Nitric Oxide" Millennial Junior Lecture in the WSU Academy of Scholars, February 22, 2000.
29. "Biological Chemistry of Nitric Oxide Donors" Parke-Davis, Ann Arbor, Michigan, November 23, 1999.
28. "Chemo-Enzymatic Synthesis of Carbohydrates" Eighth Biocatalysis and Bioprocessing Conference, The University of Iowa, October 26, 1999.

27. "Genome-Based Organic Chemistry" University of California, Irvine, Department of Chemistry, October 13, 1999.
26. "Biological Chemistry of Nitric Oxide" Department of Chemistry, University of Windsor, CANADA, September, 24, 1999.
25. "Biological Chemistry of Nitric Oxide" Wake Forest University, Department of Chemistry, September 1<sup>st</sup>, 1999.
24. "Chemo-Enzymatic Synthesis of Glycoconjugates" University of Alberta, Department of Chemistry, July 19<sup>th</sup>, 1999.
23. "Recent Progress in Green Chemistry" Department of Chemistry, University of del Valle, Cali, Columbia, February 4<sup>th</sup>, 1999.
22. "Chemo-Enzymatic Synthesis of Polysaccharides" 1998 Florida Environmental Chemistry Conference, Palm Coast Harbor Resort, December 3<sup>rd</sup>, 1998.
21. "Synthetic Contributions to Xenotransplantation and Nitric Oxide Research" Ohio State University, Department of Chemistry, November 5, 1998.
20. "Anti-viral Immunotherapy with Alpha-Gal-glycoconjugates" Utah State University, Institute for Antiviral Research, October 21, 1998.
19. "Synthetic Contributions to Xenotransplantation and Nitric Oxide Research" University of Utah, Department of Chemistry, October 20, 1998.
18. "Synthetic Contributions to Xenotransplantation and Nitric Oxide Research" University of Colorado, Department of Chemistry and Biochemistry, October 19, 1998.
17. "Synthetic Contributions to Xenotransplantation and Nitric Oxide Research" University of Toledo, Department of Chemistry, October 5, 1998.
16. "Recent Developments in Green Chemistry and Glycochemistry" Merck Inc, September 11, 1998.
15. "Green Chemistry, Glycochemistry, and Nitric Oxide Chemistry" The Fifth International Symposium For Chinese Organic Chemists, Tianjin, Nankai Univeristy, China. August 22, 1998.
14. "An Effective Chemo-Enzymatic Synthesis of  $\alpha$ -Galactosyl Epitopes Involved in the Hyperacute Rejection Upon Xenotransplantation" XIX International Carbohydrate Symposium, San Diego, August 11, 1998.
13. "Latest Progress in Glycochemistry, NO, and Green Chemistry" Lilly Inc. July 20, 1998.
12. "Chemo-Enzymatic Syntheses of Glycoconjugates: from Simple Disaccharides to Carbohydrate Polymers", Gordon Research Conference on Biocatalysis, July 7, 1998.
11. "Alpha-Gal Epitopes and Conjugates for Xenotransplantation and Immunotherapy" Biogen Inc. March 20, 1998.
10. "Green Chemistry, Glycochemistry and Nitric Oxide Chemistry" The Second Conference for Worldwide Chinese Young Chemists (CWCYC-2), Hong Kong, December, 21, 1997
9. "Chemo-Enzymatic Synthesis of Glycoconjugates and Green Chemistry", University of Florida, Department of Chemistry, October 13, 1997
8. "Chemo-Enzymatic Syntheses of Alpha-Gal Epitopes", Neose Inc. July, 11, 1997.
7. "Chemo-Enzymatic Syntheses of Carbohydrate Polymers" Hercules Incorporation, July, 10, 1997.

6. "Development of Lanthanide Catalysis in Aqueous Solution" Annual Florida Organic Meeting, St. Petersburg, February 28, 1997.
5. "Organic Reactions, Asymmetric Transformation, and Chemo-Enzymatic Synthesis", Enzyme Technology for Industrial Applications, San Diego, February 21, 1997.
4. "Development of Green Chemistry and Nitric Oxide Chemistry", Case Western Reserve University, Department of Chemistry, January 5, 1997.
3. "Development of Green Chemistry and Nitric Oxide Chemistry", University of Philadelphia, Department of Chemistry, December 11, 1996.
2. "Substituted N-Methyl-N-Nitrosoanilines Are a Novel Class of Protein S-Nitrosation Agents" The Miami Bio/Technology Winter Symposia, February 14, 1996.
1. "Chemo-Enzymatic Synthesis and Lanthanide Catalysis", Annual Florida Organic Meeting, Orlando, February 25, 1996.