

# CURRICULUM VITAE OF PETER R. ANDREANA

The University of Toledo  
Department of Chemistry  
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## PERSONAL:

Born: St. Catharines, Ontario, Canada March 20, 1973  
Citizenship: Canadian Visa Status: US Permanent Resident

## EDUCATION:

2002 – 2005 Harvard University  
NIH Postdoctoral Fellow – GM070253 Cambridge, MA  
Advisor: Stuart L. Schreiber USA  
1998 – 2002 Wayne State University  
Ph.D. (Bioorganic Chemistry) Detroit, MI  
Advisor: Peng George Wang USA  
**Doctoral Thesis Title:** Chemoenzymatic Synthesis of Biologically Significant Carbohydrates

1995 – 1998 Brock University  
Hons B.Sc. (Biochemistry) St. Catharines, ON  
Advisor: The late Herbert L. Holland Canada  
**Honors Thesis Title:** An Investigation of the Sulfoxidation of *N*-Protected Amino Acids by *Beauvaria bassiana* ATCC 7159

## CURRENT POSITION:

**The University of Toledo** 08/2016  
• Professor of Chemistry and Biochemistry and School of Green Chemistry and Engineering  
08/2012 – 2016  
• Associate Professor of Chemistry and Biochemistry and School of Green Chemistry and Engineering

## FORMER POSITION:

**Wayne State University** 08/2005 – 2012  
• Assistant Professor of Chemistry

## EXPERIENCE:

**Harvard University** 10/2002 – 07/2005  
(NIH-Postdoctoral Fellow) F32 Ruth L. Kirschstein  
• Synthesis of skeletally diverse small molecule library using Lanterns® and MacroBeads®  
• Employed Diversity Oriented Synthesis (DOS) for the construction of a 4CCR/IMDA library with a diverse skeletal array  
• Developed a chiral Zr(IV) Lewis acid for a catalytic asymmetric Ugi reaction  
• Developed a chiral Cu(II) Lewis acid for a catalytic asymmetric Passerini reaction  
• Contributing author on successful 2003 NIH-CMLD center grant

**Wayne State University** 09/1998 – 10/2002  
(Pharmacia Upjohn-Graduate Student)  
• Synthesized natural and unnatural sugars employing RCM  
• Developed a one-pot chemo-enzymatic synthesis of 7-membered polyhydroxyazepanes

- Developed a chemo-enzymatic combinatorial carbohydrate library of  $\alpha$ -gal epitopes in solution phase and on solid support
- Examined conformationally constrained  $\alpha$ -gal epitopes
- Contributing author on successful 1998 WSU Prostate Initiative grant: "Development of Prostate-Specific Antitumor Agents"

**Brock University** 05/1996 – 09/1998  
(Honors-Undergraduate)

- Synthesized chiral lactones as natural food additives utilizing whole cell microorganisms
- Synthesized chiral sulfoxides for the development of an active site model for the whole cell microorganism *Helminthosporium sp* NRRL 4671 and *Mortierella isabellina* ATCC 42613
- Examined the sulfoxidation of methionine series as well as unnaturally occurring amino acids for the understanding of food degradation
- Developed a kinetic resolution procedure of amino acids using a benzamidase from the whole cell microorganism *Beauvaria bassiana* ATCC 7159

#### HONORS AND AWARDS:

- Gordon Research Conference Carbohydrates – Elected Vice Chair, China, 2019
- President's Award for Excellence in Grantsmanship, 03/2017
- ACS New Investigator Award - Carbohydrate Division, 03/2010
- NIH GM070253 – Postdoctoral Fellowship, 04/2004 – 07/2005
- Summer 2001 Dissertation Fellowship, WSU, 05/2001
- Norman A. Lebel Graduate Award in Organic Chemistry, WSU, 05/2000
- Willard R. Lenz, Jr. Memorial Scholarship, WSU, 05/2000
- NSERC Postgraduate Scholarship B, NSERC/Canada, 03/2000 (declined)
- Graduate Student Professional Travel Award, WSU, 10/1999
- Pharmacia Upjohn Professional Development Award, 12/1998
- Queen's Graduate Award, Queen's Univ., Kingston, Ont. 06/1998 (declined)

#### FUNDING:

- |    |  |               |                  |
|----|--|---------------|------------------|
| 1. | NIH U01 GM 125271-01   | 08/17 – 07/21 | \$1,031,960 4 y  |
|    | "Novel Methods and Technologies for Synthesis of Biomedically Relevant Carbohydrates" Co-PI  |               |                  |
| 2. | NIH R01 CA 156661-01   | 09/11 – 07/17 | \$1,731,870 6 y  |
|    | "Entirely Carbohydrate Vaccine Constructs and Their Application in Probing Glycoimmunology" PI   |               |                  |
| 3. | NIH R03 CA 153936-02   | 05/10 – 04/12 | \$138,022 for 2y |
|    | "Chemical Development of Fluorescent Labeling Tags for DNA Damaged Sites" PI   |               |                  |
| 4. | WSU University Research Grant (145767)   | 05/06 – 05/07 | \$10,000 for 1y  |
|    | "Deciphering a Carbohydrate Code for T-Cell Elicitation by Developing a Combinatorial Carbohydrate Library and Carbohydrate-Based Micro Array" |               |                  |

#### PUBLICATIONS:

##### A. Refereed Journals

55. Santra, S.; Tiruchinapally, G.; Chen, S.; **Andreana, P. R.** (2018) Electron Tuning of Benzyl-based Protecting Groups: Development of an Orthogonal Functional Handle Cleavable Under Neutral Conditions. (In Preparation) (PI).
54. Premnauth, G.; Trabbic, K. R.; Yuan, Y.-Y.; Bhagwat, A.; Bryant-Friedrich, A.; **Andreana, P. R.** (2018) A Chemical Indirect Quantification Method of 5-Hydroxymethylcytosine. (In Preparation) (PI).

53. Ghosh, S.; Nishat, S.; Eradi, P.; **Andreana, P. R.** (2018) Synthesis of Tumor Antigen Aminoxy Globo-H and Conjugation to Zwitterionic Polysaccharide PS A1 for Immunological Evaluation. (In Preparation) (PI).
52. Bourgault, J.-P.; Esmati, N.; Maddirala, A. R.; **Andreana, P. R.** (2018) Mechanistic Insights for *syn/anti* Substituents on Herbicide Thaxtomin A and Derivatives. (In Revision) (PI).
51. Trabbic, K. R.; Bourgault, J.-P.; Shi, M.; Kleski, K. A.; **Andreana, P. R.** (2018) Increasing the Immunogenicity of the TF-Antigen by MGL2 Receptors with Bivalent PS A1 Conjugates. (In Revision) (PI).
49. Hohol, R. E.; Arcure, H.; Witzczak, Z.; Bielski, R.; Kirschbaum, K.; **Andreana, P.**; Mencer, D. E. (2018) One-pot synthesis of carbohydrate exo-cyclic enones and hemiketals with 6,8-dioxabicyclo-[3.2.1]octane moieties. Serendipitous formation of a spironolactone when 2-pyridinecarboxaldehyde is used as the reactant. Part II *Tetrahedron* 74: 7303-7309. (Co-PI).
48. Eradi, P.; Ghosh, S.; **Andreana, P. R.** (2018) Total Synthesis of Zwitterionic Tetrasaccharide Repeating Unit from *Bacteroides fragilis* ATCC 25285/NCTC 9343 Capsular Polysaccharide PS A1 with Alternating Charges on Adjacent Monosaccharides. *Organic Letters* 20: 4526-4530. (PI).
47. Esmati, N.; Maddirala, A. R.; Hussein, N.; Amawi, H.; Tiwari, A. K.; **Andreana, P. R.** (2018) Efficient Syntheses and Anti-Cancer Activity of Xenortides A-D Including *ent/epi*-Stereoisomers *Organic and Biomolecular Chemistry* 16: 5332-5342. (PI).
46. Maddirala, A. R.; **Andreana, P. R.** (2018) Methyl Isocyanide as a Convertible Functional Group for the Synthesis of Spirocyclic Oxindole  $\gamma$ -Lactams *via* Post Ugi-4CR/Transamidation/Cyclization in a One-Pot Three Step Sequence. *Beilstein Journal of Organic Chemistry* 14: 875-883. (PI).
45. Trabbic, K. R.; Kleski, K. A.; Shi, M.; Bourgault, J.-P.; Prendergast, J. M.; Dransfield, D. T.; **Andreana, P. R.** (2018) Production of a Mouse Monoclonal IgM Antibody that Targets the Carbohydrate Thomsen-nouveau Cancer Antigen Resulting in in vivo and in vitro Tumor Killing. *Cancer Immunology, Immunotherapy* 67: 1437-1447. (PI).
44. Patel, K.; Song, F.; **Andreana, P. R.** (2017) Synthesis of Substrate Analogues as Potential Inhibitors for Mycobacterium tuberculosis enzyme MshC. *Carbohydrate Research* 453-454: 10-18. (PI).
43. Jeelani, R.; Jahanbakhsh, S.; Kohan-Ghadr, H.-R.; Thakur, M.; Khan, S.; Aldhaheri, S. R.; Yang, Z.; **Andreana, P. R.**; Morris, R.; Abu-Souda, H. M. (2017) Mesna (2-Mercaptoethane Sodium Sulfonate) Functions as a Regulator of Myeloperoxidase. *Free Radical Biology and Medicine* 110: 54-62. (Co-PI).
42. Shi, M.; Kleski, K. A.; Trabbic, K. R.; Bourgault, J.-P.; **Andreana, P. R.** (2016) STn-PS A1 as an Entirely Carbohydrate Immunogen: Synthesis and Immunological Evaluation. *Journal of the American Chemical Society* 138: 14264-14272. (PI).
41. Nishat, S.; **Andreana, P. R.** (2016) Entirely Carbohydrate-based Vaccines: An Emerging Field for Specific and Selective Immune Responses. *Vaccines* 4: 19. (PI).
40. Ghosh, S.; Nishat, S.; **Andreana, P. R.** (2016) Synthesis of an Aminoxy Derivative of the Tetrasaccharide Repeating Unit of *Streptococcus dysgalactiae* 2023 Polysaccharide and a PS A1 Conjugate Vaccine. *Journal of Organic Chemistry* 81: 4475-4484. (PI).
39. Trabbic, K. R.; Bourgault, J.-P.; Shi, M.; Clark, M.; **Andreana, P. R.** (2016) Immunological Evaluation of the Entirely Carbohydrate-based Thomsen-Friedenreich - PS B Conjugate. *Organic and Biomolecular Chemistry* 14: 3350-3355. (PI).
38. Maddirala, A. R.; **Andreana, P. R.** (2016) Synthesis of 3-Substituted-2-Indolinones *via* a Multicomponent Coupling Isocyanide Dependent Microwave-Assisted Intramolecular Transamidation Process. *European Journal of Organic Chemistry* 196-209. (PI).
37. Shaik, A. A.; Nishat, S.; **Andreana, P. R.** (2015) Stereoselective Synthesis of Natural and Non-natural Thomsen-nouveau Antigens and Hydrazide Derivatives. *Organic Letters* 17: 2582-2585. (PI).

36. Bourgault, J. P.; Maddirala, A.; **Andreana, P. R.** (2014) A One-Pot Multicomponent Coupling/Cyclization for Natural Product Herbicide ( $\pm$ )-Thaxtomin A. *Organic and Biomolecular Chemistry* 12: 8125-8127. (PI). *Inside Cover Art*.
35. Ghosh, S.; **Andreana, P. R.** (2014) Synthesis of an Aminoxy Derivative of the Trisaccharide Globotriose Gb3. *Journal of Carbohydrate Chemistry* 33: 381-394. (PI)
34. Trabbic, K. R.; De Silva, R. A.; **Andreana, P. R.** (2014) Elucidating Structural Features of an Entirely Carbohydrate Cancer Vaccine Construct Employing Circular Dichroism and Fluorescent Labeling. *Medicinal Chemistry Communication* 5: 1143-1149. (PI).
33. Bourgault, J. P.; Trabbic, K. R.; Shi, M.; **Andreana, P. R.** (2014) Synthesis of the Tumor Associative  $\alpha$ -Aminoxy Disaccharide of the TF Antigen and its Conjugation to a Polysaccharide Immune Stimulant. *Organic and Biomolecular Chemistry* 12: 1699-1702. (PI). *Cover Art*.
32. Abu-Soud, H. M.; Maitra, D.; Shaeib, F.; Byun, J.; Abdulhamid, I.; Saed, G. M.; Diamond, M. P.; **Andreana, P. R.**; Pennathur, S. (2014) Disruption of Heme-Peptide Covalent Cross-Linking in Mammalian Peroxidases by Hypochlorous Acid *Journal of Inorganic Biochemistry* 140: 245-254. (Co-PI).
31. De Silva, R. A.; Appulage, D. K.; Pietraszkiewicz, H.; Bobbitt, K. R.; Media, J.; Shaw, J.; Valeriote, F. A.; **Andreana, P. R.** (2012) The Entirely Carbohydrate Immunogen Tn-PS A1 Induces a Cancer Cell Selective Immune Response and Cytokine IL-17. *Cancer Immunology, Immunotherapy* 61: 581-585. (PI).
30. Shaw, J.; Chen, B.; Bourgault, J. P.; Jiang, H.; Kumar, N.; Mishra, J.; Valeriote, F. A.; Media, J.; Bobbitt, K.; Pietraszkiewicz, H.; Edelstein, M.; **Andreana, P. R.** (2012) Synthesis and Biological Evaluation of Novel *N*-phenyl-5-carboxamidyl Isoxazoles as Potential Chemotherapeutic Agents for Colon Cancer. *American Journal of Biomedical Sciences* 4: 14-25. (Co-PI).
29. Abu-Soud, H. M.; Maitra, D.; Byun, J.; Souza, C. E. A.; Banerjee, J.; **Andreana, P. R.**; Pennathur, S. (2012) The Reaction of HOCl and Cyanocobalamin: Corrin Destruction and the Liberation of Cyanogen Chloride. *Free Radical Biology and Medicine* 52: 616-625. (Co-PI).
28. Santra, S.; **Andreana, P. R.** (2011) A Bioinspired Ugi/Michael/aza-Michael Cascade Reaction in Aqueous Media: Natural Product-Like Molecular Diversity. *Angewandte Chemie International Edition* 50: 9418-9422. (PI) Designated as Hot Paper.
27. Maitra, D.; Byun, J.; **Andreana, P. R.**; Abdulhamid, I.; Diamond, M. P.; Saed, G. M.; Pennathur, S.; Abu-Soud, S. M. (2011) Reaction of Hemoglobin with HOCl: Mechanism of Heme Destruction and Free Iron Release. *Free Radical Biology and Medicine* 51: 374-386. (Co-PI).
26. Maitra, D.; Byun, J.; **Andreana, P. R.**; Abdulhamid, I.; Saed, G. M.; Diamond, M. P.; Pennathur, S.; Abu-Soud, S. M. (2011) Mechanism of Hypochlorous Acid-Mediated Heme Destruction and Free Iron Release. *Free Radical Biology and Medicine* 51: 364-373. (Co-PI).
25. Santra, S.; Jonas, E.; Bourgault J.-P.; El-Baba, T; **Andreana, P. R.** (2011) Kinetic Products Under Thermal Conditions: Rapid Entry into Anomeric Substituted  $\alpha/\beta$ -D-Galactofuranosides Using Microwave Irradiation and Selective Lewis Acids. *Journal of Carbohydrate Chemistry* 30: 27-40. (PI).
24. Santra, S.; **Andreana, P. R.** (2011) A Rapid, One-Pot, Microwave-Influenced Synthesis of Spiro-2,5-Diketopiperazines *via* a Cascade Ugi/6-*exo-trig* aza-Michael Reaction. *Journal of Organic Chemistry* 76: 2261-2264. (PI).
23. De Silva, R. A.; Wang, Q.; Chidley, T.; Appulage, D. K.; **Andreana, P. R.** (2009) Immunological Response from an Entirely Carbohydrate Antigen: Design of Synthetic Vaccines Based on Tn-PS A1 Conjugates. *Journal of the American Chemical Society* 131: 9622-9623. (PI).
22. Yatawara, A. K.; Tiruchinapally, G.; Bordenyuk, A. N.; **Andreana, P. R.**; Benderskii, A. V. (2009) Carbohydrate Surface Attachment Characterized by Sum Frequency Generation Spectroscopy. *Langmuir* 25: 1901-1904. (Co-PI).
21. De Silva, R. A.; Santra, S.; **Andreana, P. R.** (2008) A Tandem One-Pot, Microwave-Assisted Synthesis of Regiochemically Differentiated 1,2,4,5-Tetrahydro-1,4-benzodiazepin-3-ones. *Organic Letters* 10: 4541-4544. (PI). Highlighted In: Organic Chemistry Portal (Org. Chem. Highlights) **October 15, 2008**.

20. Santra, S.; **Andreana, P. R.** (2007) A One-Pot, Microwave-Influenced Synthesis of Diverse Small Molecules by Multicomponent Reaction Cascades. *Organic Letters* 9: 5035-5038. (PI). Highlighted In: Organic Chemistry Portal (Org. Chem. Highlights) **November 15, 2007**.
19. **Andreana, P. R.**; Liu, C. C.; Schreiber, S. L. (2004) Stereochemical Control of the Passerini Reaction. *Organic Letters* 6: 4231-4233. (Post-doc work).
18. **Andreana, P. R.**; Kowal, P.; Janczuk, A. J.; Wang, P. G. (2004) Alpha-Galactosyl Trisaccharide Epitope: Modification of the 6-Primary Positions and Recognition by Human Anti- $\alpha$ -Gal Antibody. *Glycoconjugate Journal* 20: 107-118. (Ph.D. work).
17. Sello, J. K.; **Andreana, P. R.**; Lee, D.; Schreiber, S. L. (2003) Stereochemical Control of Skeletal Diversity. *Organic Letters* 5: 4125-4127. (Post-doc work).
16. Postema, M. H. D.; Piper, J. L.; Liu, L.; Shen, J.; Faust, M.; **Andreana, P.** (2003) Synthesis and Partial Biological Evaluation of a Small Library of Differentially-Linked -C-Disaccharides. *Journal of Organic Chemistry* 68: 4748-4754. (Ph.D. work).
15. **Andreana, P. R.**; McLellan, J. S.; Chen, Y.; Wang, P. G. (2002) Synthesis of 2,6-Dideoxysugars via Ring Closing Olefinic Metathesis. *Organic Letters* 4: 3875-3878. (Ph.D. work). Hot Article Oct./02. Cited in C&EN News Dec. 23/02.
14. **Andreana, P. R.**; Sanders, T.; Janczuk, A.; Warrick, J. I.; Wang, P. G. (2002) Chemo-Enzymatic Synthesis of Polyhydroxyazepanes. *Tetrahedron Letters* 43: 6525-6528. (Ph.D. work).
13. Janczuk, A. J.; Zhang, W.; **Andreana, P. R.**; Warrick, J.; Wang, P. G. (2002) The Synthesis of Deoxy  $\alpha$ -Gal Epitope Derivatives for the Evaluation of Anti- $\alpha$ -Gal Antibody Binding. *Carbohydrate Research* 337: 1247-1259. (Ph.D. work).
12. **Andreana, P. R.**; Xie, W.; Cheng, H. N.; Qiao, L.; Murphy, D. J.; Gu, Q. M.; Wang, P. G. (2002) In-Situ Preparation of  $\beta$ -D-1-O-Hydroxylamino Carbohydrate Polymers Mediated by Galactose Oxidase. *Organic Letters* 4: 1863-1866. (Ph.D. work).
11. Zhang, J.; Kowal, P.; Fang, J.; **Andreana, P.**; Wang, P. G. (2002) Efficient Chemoenzymatic Synthesis of Globotriose and Its Derivatives with a Recombinant  $\alpha$ -(1 $\rightarrow$ 4)-Galactosyltransferase. *Carbohydrate Research* 337: 969-976. (Ph.D. work).
10. Chen, X.; Zhang, J.; Kowal, P.; Liu, Z.; **Andreana, P. R.**; Lu, Y.; Wang, P. G. (2001) Transferring a Biosynthetic Cycle into a Productive *Escherichia coli* Strain: Large-Scale Synthesis of Galactosides. *Journal of the American Chemical Society* 123: 8866-8867. (Ph.D. work).
9. Chen, X.; Fang, J.; Zhang, J.; **Andreana, P. R.**; Shao, J.; Kowal, P.; Wang, P. G. (2001) Sugar Nucleotide Regeneration Beads (Superbeads): A Versatile Tool for Practical Synthesis of Oligosaccharides. *Journal of the American Chemical Society* 123: 2081-2082. (Ph.D. work).
8. Holland, H. L.; **Andreana, P. R.**; Salehzadeh-Asl, R.; van Vliet, A.; Ihasz, N. J.; Brown, F. M. (2000) *Beauveria bassiana* ATCC 7159 Contains an L-Specific  $\alpha$ -Amino Acid Benzamidase. *Monatshefte für Chemie* 131: 667-672. (Hons B.Sc. work).
7. Hou, Y. -C.; Chen, Y. -S.; Amro, N. A.; Wadu-Mesthrige, K.; **Andreana, P. R.**; Wang, P. G. (2000) Nano-Molar Scale Nitric Oxide Generation From Self-Assembled Monolayer Modified Gold Electrodes. *Chemical Communication* 19: 1831-1832. (Ph.D. work). Editor's Choice in Science, Oct. 13/00.
6. Fang, J. W.; Chen, X.; Zhang, W.; Wang, J. Q.; **Andreana, P. R.**; Wang, P. G. (1999) A Unique Chemoenzymatic Synthesis of  $\alpha$ -Galactosyl Epitope Derivatives Containing Free Amino Groups: Efficient Separation and Further Manipulation. *Journal of Organic Chemistry* 64: 4089-4094. (Ph.D. work).
5. Chen, X.; **Andreana, P. R.**; Wang, P. G. (1999) Carbohydrates in Transplantation. *Current Opinion in Chemical Biology* 3: 650-658. (Ph.D. work).

4. Hou, Y.-C.; Wang, J.-Q.; **Andreana, P. R.**; Cantauria, G.; Tarasia, S.; Sharp, L.; Braunschweiger, P. G.; Wang, P. G. (1999) Targeting Nitric Oxide to Cancer Cells: Cytotoxicity Studies of Glyco-S Nitrosothiols. *Bioorganic and Medicinal Chemistry Letters* 9: 2255-2258. (Ph.D. work).
3. Holland, H. L.; Turner, C. D.; **Andreana, P. R.**; Nguyen, D. (1999) Biotransformation of Organic Sulfides. Part 12. Conversion of Heterocyclic Sulfides to Chiral Sulfoxides by *Helminthosporium sp* NRRL 4671 and *Mortierella isabellina* ATCC 42613. *Canadian Journal of Chemistry Revue Canadienne de Chimie* 77: 463-471. (Hons. B.Sc. work).
2. Holland, H. L.; **Andreana, P. R.**; Brown, F. M. (1999) Biocatalytic and Chemical Routes to all the Stereoisomers of Methionine and Ethionine Sulfoxides. *Tetrahedron: Asymmetry* 10: 2833-2843. (Hons B.Sc. work).
1. Holland, H. L.; Kohl, A.; Larsen, B. G.; **Andreana, P.**; Gu, J. X. (1997) Preparation of Substituted (R)-2-Alkanols by Microbial Hydroxylation. *Journal of Molecular Catalysis B-Enzymatic*. 2: L253-L255. (Hons B.Sc. work).

## B. Chapters

5. Patel K., **Andreana P.R.** (2018) "Recent Advances in the Stereochemical Outcome of Multicomponent Reactions Involving Convertible Isocyanides" In: Witczak Z., Bielski R. (eds) *Coupling and Decoupling of Diverse Molecular Units in Glycosciences*. Springer, Cham (PI).
4. Santra, S.; Andreana, T. L.; Bourgault, J.-P.; **Andreana, P. R.** (2015) "Convertible Isocyanides: Application in Small Molecule Synthesis, Carbohydrate Synthesis and Drug Discovery" In *Domino and Rearrangement Reactions in Glycoscience* Edited by: Z. Witczak and R. Bielski. John Wiley & Sons Publisher Production Department. ISBN: 9781119044208. (PI)
3. Ghosh, S.; **Andreana, P. R.** (2015) "Di-t-butylsilyl Bis(trifluoromethanesulfonate)". *e-EROS Encyclopedia of Reagents for Organic Synthesis* March 11, 2015. (PI)
2. **Andreana, P. R.**; Xie, W.; Wang, P. G. "Synthesis and Modifications of Carbohydrates Through Biotechnology" In *Biocatalysis in Polymer Science* 840 pgs. 188-202. ACS Symposium Series, Edited by: R. Gross and H.N. Cheng. ACS Books, Washington DC, 2003. (Ph.D. Work).
1. **Andreana, P. R.**; Zhang, W.; Wang, P. G. "From a Carbohydrate Sequence to Extensive Research Programs, the alpha-Gal Epitope as a Case Study" In *Glycochemistry: Principles, Synthesis, and Applications* pgs. 581-624. Edited by: P.G. Wang and C. Bertozzi. Marcel Dekker, Inc. New York, 2001. (Ph.D. Work).

## SERVICE:

### A) Activities at The University of Toledo

#### Department:

Department of Chemistry and Biochemistry Webmaster 2016 –  
 Graduate Examinations Committee 2015 –  
 Library Representative 2015 –  
 Safety Committee 2015 –  
 Industrial Relations 2015 – 2016  
 School of Green Chemistry and Engineering Faculty Search 2015 – 2016  
 Chair of Colloquium Committee 2014 – 2015  
 Graduate Recruiting 2014 – 2015  
 Chair of Graduate Recruiting 2013 – 2014  
 Colloquium Committee 2013 – 2014  
 Personnel Committee 2012 –  
 Graduate Recruiting 2012 – 2013  
 School of Green Chemistry and Engineering Faculty Search 2012 – 2013

#### College and Upper Administration:

Faculty Senate 2018 –  
 Committee for Investigative Research Misconduct 2018 –

Department of Laboratory Animal Resources Committee 2017 –  
College of Graduate Studies Committee – Graduate Program Review of the Graduate Council 2016 – 2017  
University Research Council 2014 – 2017  
Natural Science and Mathematics Council Secretary 2015 – 2016  
Natural Science and Mathematics Council 2013 – 2016  
Natural Science and Mathematics Curriculum Committee 2014 – 2015  
College of Graduate Studies Committee 2012 – 2015

National/International Activities

Immediate Past Chair of the ACS Division of Carbohydrate Chemistry 2020 – 2022  
Editorial Board – Journal of Carbohydrate Chemistry, Taylor & Francis 2018 –  
Chair of the ACS Division of Carbohydrate Chemistry 2018 – 2020  
Chair-Elect of the ACS Division of Carbohydrate Chemistry 2017 – 2019  
Treasurer of the United States Advisory Committee for the International Carbohydrate Symposium 2015 –  
Webmaster of the ACS Carbohydrate Division 2014 –  
Editorial Advisory Board – Diversity Oriented Synthesis Journal, De Gruyter 2012 –

**B) Activities at Wayne State University**

PLU Faculty Advisor 2005 – 2012  
Wayne First Campaign 2006 – 2009  
Graduate recruiting committee member - Served as Organic Division recruiter. 2006 – 2010  
Undergraduate Honors/Chemistry Majors Research Advisor 2006 – 2010  
New GTA Orientation Participant 2006 – 2012  
Awards Committee 2006 – 2012  
Web Page Committee 2006 – 2012  
Junior Science and Humanities Symposium 2008 – 2012  
Faculty search committee for department of pharmacy 2009 – 2010  
Organic Division Seminar Scheduler 2009 – 2012

**C) Other Professional Activities (Study Section Reviewer)**

Oct. 2010 Ad hoc member, NIH study section – SBCA  
Sept. 2011 Reviewer, NIH study section – ZAI1 RGK-M(J2) Partnerships Biodefense  
Oct. 2011 NIH/NIAID Workshop “Carbohydrate Moieties as Vaccine Candidates”  
Nov. 2012 Ad hoc reviewer, NSF/MCB  
April 22-24, 2013 NIH/NIAID BAA study section “Adjuvant Development Program”  
June 10-11, 2013, Ad hoc member, NIH study section – SBCA  
Nov. 13-14, 2013, SEP member, NIH/NIAID RFA-AI-13-013 “Partnerships for Biodefense”  
Jan. 7-9, 2014, SEP member, NIH/NIAID ZAI1-AWA-M-J1 “Partnerships for Biodefense”  
Feb. 2, 2014, Ad hoc review, NSF/CLP  
Feb. 13, 2014, NSF “Chemical Synthesis Virtual Panel-G”  
March 12-13, 2014, NIH ZRG1 F04A-W “Fellowships: Synthetic and Biological Chemistry”  
Feb. 24-25, 2015, NIH RFA-AI-14-015 “2015/05 ZAI1 AWA-M (M1) 2, Development of Novel Therapeutics for Select Anaerobic Protozoa”  
March 16, 2015, NSF CHE CLP Review Panel CARBS P151137  
March 3-4, 2016, NSF CLP Review Panel  
Nov. 17-18, 2016, NIH  
Dec. 14, 2016, NSF  
March 13-14, 2017 NIH - Special Emphasis Panel (ZAI1-MFH-M-M2) (R01)  
May 3-4, 2017 NIH - Special Emphasis Panel (ZAI1-AWA-M-M2 Zika) (R01)  
Oct. 23-25, 2017 NIH - Special Emphasis Panel (BAA) (HHS-NIH-NIAID-BAA2017-1)  
Feb. 9, 2018 NIH - Driving Biomedical Projects (DBPs) (NIH-P41)  
March 14-15, 2018 NIH - Ruth L. Kirschstein National Research Service Award (NRSA) ZRG1 F04A H20  
June 25, 2018 NIH - Special Emphasis Panel (ZRG1 BCMB-G B Meeting)  
November 15-16, 2018 – SEP – F04A – Pre- and Post-Doctoral NIH Fellowships  
November 28-29, 2018 NIH - BAA-Vaccine Adjuvant Discovery Program

**D) Mail/Review proposals for:**

Netherlands Review Panel (VICI Life)  
Canadian Glycomics Network (CGN)  
Foundation for Research Science & Technology (FRST), New Zealand  
Foundation for Research, Science and Technology New Economy Research Fund (NERF)  
National Science Foundation – (CAREER and Regular)  
Natural Sciences and Engineering Research Council of Canada (NSERC)  
Ohio Cancer Research Associates  
Petroleum Research Foundation of the American Chemical Society

**E) Review manuscripts for:**

J. Am. Chem. Soc., J. Org. Chem., Chem. Commun., Org. Lett., Angew. Chemie., Tetrahedron, Tetrahedron Lett., Eur. J. Org. Chem., Synthesis, Adv. Synth. Catal., Cancer Immun. Immunother., Carbohydr. Res., Chirality, Bioorg. Med. Chem., Lett. Org. Chem., Curr. Med. Chem., J. Carbohydr. Chem., Org. Biomol. Chem., Biochemistry, Mol. Biosys., Med. Chem. Rev., J. Med. Chem., J. Vac. Acc. Chem. Res., ACS Chem. Biol., ACS Combinatorial Chem., ACS Infect. Disease, ACS Omega, Analytica Chem., App. Mat., Bioconjugate Chem., Beilstein J. Org. Chem., Biomolecular Chem., Cancer Epidemiology Bio. Prev., Cancer Immunother., Cancer Res., Carb. Res., Chem. Eur. J., Chem. Rev., Chem. Sci., Chem. Asian J., Chem. Biodiversity, J. Oncology

**PRESENTATIONS:**

39. 4<sup>th</sup> Glycobiology World Congress 2018 (09/16-09/19) Rome, Italy. "Employing Chemical Glycobiology for Immunotherapeutic Approaches Directed at Cancer" (invited talk)
38. 29<sup>th</sup> International Carbohydrate Symposium 2018 (07/14-07/19) Lisboa, Portugal. "Entirely Carbohydrate Immunogens for Anti-Tumor mAb Development" (invited talk)
37. 13<sup>th</sup> Annual Midwest Carbohydrate Symposium (09/22-09/23/2017) University of Wisconsin, Madison. "Synthesis and Biological Evaluation of STn-PS A1 as a Tumor Immunogen" (invited talk).
36. 254<sup>th</sup> ACS National Meeting in Washington, DC Arlington/Cabin John/Roosevelt – Grand Hyatt Washington DC, August 20, 2017 "Entirely Carbohydrate-based Immunotherapies Targeting Cancer." (invited talk)
35. Carbohydrates Gordon Research Conference Mount Snow, West Dover, VT June 28<sup>th</sup>, 2017. "An Entirely Carbohydrate-Recognizing Monoclonal Antibody." (invited talk)
34. 253<sup>rd</sup> ACS National Meeting and Exposition (04/02-06/2017) San Francisco, CA. "Synthesis and Biological Evaluation of STn-PS A1 as a Tumor Immunogen." (invited talk on behalf of 2017 ACS Hudson Award Symposium)
33. International Carbohydrate Symposium (07/17-21/2016) New Orleans, LA. "Increasing carbohydrate antigen immunogenicity by targeting MGL2 receptors with bivalent PS A1 conjugates." (invited talk)
32. PACIFICHEM (12/15-20/2015) Honolulu, Hawaii. "Sugar-based multicomponent coupling reactions for 'Click' conjugation." (invited talk)
31. 250<sup>th</sup> ACS National Meeting and Exposition (08/16-21/2015) Boston, MA. "Investigation of anticancer entirely carbohydrate constructs Tn-PS A1 and TF-PS B." (invited talk)
30. GRC Carbohydrates (06/14-19/2015) Mount Snow, West Dover, VT. "Investigation of Anti-Cancer Entirely Carbohydrate Immunogens, Tn-PS A1 and TF-PS B." (poster)
29. 249<sup>th</sup> ACS National Meeting and Exposition (03/22-26/2015) Denver, CO. "Entirely Carbohydrate-based Cancer Vaccines for Disease Prevention and Treatment." (invited talk)
28. 10<sup>th</sup> Annual Midwest Carbohydrate Symposium (10/17-10/18/2014) University of Michigan, Ann Arbor, MI. "Entirely Carbohydrate-based Cancer Vaccines for Disease Prevention and Treatment." (invited talk).



27. NCI at Frederick - Cancer Immunology and Immunotherapy: Delivering the Promise (10/09-10/2014) Bethesda, MD. "Investigation of Anti-Cancer Entirely Carbohydrate Constructs Tn-PS A1 and TF-PS B." (invited poster)
26. 248th ACS National Meeting and Exposition (08/10-14/2014) San Francisco, CA. "Microwave-Assisted Multicomponent Cascade Couplings with Carbohydrates." (invited talk)
25. 247th ACS National Meeting and Exposition (03/16-20/2014) Dallas, TX. "Synthesis and biological evaluation of the tumor associative alpha-aminoxy disaccharide of the TF antigen conjugated to a polysaccharide immune stimulant." (invited talk)
24. GRC Carbohydrates (06/16-21/2013) Mount Snow, West Dover, VT. "PS A1 as a Covalent Adjuvant in Immune Stimulation." (invited talk)
23. 244th ACS National Meeting and Exposition (08/19-23/2012) Philadelphia, PA. "Synthetic Thomsen-nouveau (Tn) Antigen Conjugated to Zwitterionic Polysaccharide PS A1 for an Entirely Carbohydrate Immunogen Construct." (invited talk)
22. 16th ACS Green Chemistry and Engineering Conference (06/18-20/2012) Washington, DC. "Atom Economical DOS with Microwave Assistance for Biologically Validated Scaffolds." (talk)
21. 241st ACS National Meeting and Exposition (03/26-31/2011) Anaheim, CA. "Entirely Carbohydrate Cancer Immunogen Elicits a Specific Immune Response." (invited talk)
20. 5th Annual Midwest Carbohydrate Symposium (10/01-10/02/2010) University of Toledo, Toledo, OH (invited talk).
19. 240th ACS National Meeting and Exposition (08/22-26/2010) Boston, MA "Entirely Carbohydrate Vaccine Constructs and Their Application in Probing Glycoimmunology." (invited talk) *ACS New Investigator Award - Carbohydrate Division*
18. NSF Natural Products Workshop (07/22-26/2010) Squam Lake, Dartmouth, NH
17. 2010 Bioorganic Chemistry Gordon Research Conference (06/13-18/2010) Proctor Academy, Andover, NH "Targeting Cellular Immunity with Entirely Carbohydrate-based Constructs" (poster talk)
16. 93rd Canadian Chemistry Conference and Exhibition (05/29 - 06/02/2010) Toronto, Canada. "Vaccines are Powerful Tools for Disease Prevention and Therapy" (invited talk)
15. NIH & FDA Glycosciences Research Day (05/24/2010) Natcher Conference Center, Bethesda, Maryland "An Entirely Carbohydrate Vaccine Construct Based on the Tn-PS A1 Conjugate" (poster)
14. 239th ACS National Meeting and Exposition (03/21-25/2010) San Francisco, CA "Entirely Carbohydrate-Based Cancer Vaccine Constructs Elicit Selective Cellular Immunity." (invited talk)
13. 4th Annual Midwest Carbohydrate Symposium (10/02-03/2009) University of Cincinnati, Cincinnati, OH "Immunological Response from an Entirely Carbohydrate Antigen: Design of Synthetic Vaccines Based on Tn-PS A1 Conjugates" (invited talk).
12. 238th ACS National Meeting and Exposition (08/16-20/2009) Washington, DC. "Immunological Responses from an Entirely Carbohydrate Antigen: Design of Synthetic Vaccines Based on Tn-PS A1 Conjugates." (invited talk).
11. 2009 Central Regional Meeting of the American Chemical Society CERMACS '09 (05/20-23/2009) Cleveland, OH. "Zwitterionic Polysaccharide for a Complete Carbohydrate-Base Vaccine" (invited talk).
10. 237th ACS National Meeting and Exposition (03/22-26/2009) Salt Lake City, UT. "Zwitterionic Polysaccharide (PS A1) as an Immune Elicitor for Vaccine Development" (talk).
9. 232nd ACS National Meeting and Exposition (09/09-14/2006) San Francisco, CA "Single Step Synthesis and Biological Studies of Substituted 1,4-Dihydroisoquinolones" (talk).
8. 231st ACS National Meeting and Exposition (03/26-30/2006) Atlanta, GA "Microwave Assisted Single-Step Synthesis of Skeletally Diverse Compounds From a Multicomponent Coupling Reaction" (poster).

7. 222<sup>nd</sup> ACS National Meeting, (08/26-30/2001) Chicago, IL "Ring Closing Metathesis and Asymmetric Amino/Dihydroxylation for the Preparation of 2,6-Dideoxy Amino and 2,6-Dideoxy Hydroxyl Sugars" (poster).
6. 37<sup>th</sup> National Organic Symposium (06/10-14/2001) Montana State University "Ring Closing Metathesis and Asymmetric Amino/Dihydroxylation for the Preparation of 2,6-Dideoxy Amino and 2,6-Dideoxy Hydroxyl Sugars" (poster).
5. 2<sup>nd</sup> Chemistry Graduate Student Research Symposium (08/18/2000) Wayne State University "Chemoenzymatic Combinatorial alpha Gal Trisaccharide Libraries" (talk).
4. 8<sup>th</sup> Biocatalysis and Bioprocessing Conference (10/20/1999) University of Iowa "Enzymes in the Preparation and Modification of Carbohydrates" (poster).
3. Chemistry Graduate Student Research Symposium (08/15/1999) Wayne State University "Conformationally Constrained alpha-Galactosyl Epitopes" (poster).
2. 9<sup>th</sup> Quebec/Ontario Minisymposium in the Bioorganic and Synthetic Organic Chemistry (10/31/1998), Brock University "Chiral Sulfoxidation of *N*-protected Thia-Amino Acids by *Beauveria bassiana*" (poster).
1. 7<sup>th</sup> Quebec/Ontario Minisymposium in the Bioorganic and Synthetic Organic Chemistry (10/27/1996) University of Waterloo "Synthetic Approaches to Chiral Lactones via Microbial Hydroxylation" (poster).

#### COURSES TAUGHT :

*At The University of Toledo*

CHEM 2410 Organic Chemistry I

CHEM 2420 Organic Chemistry II

CHEM 8410/6410/4410 Advanced Organic Synthesis

*At Wayne State University*

CHM 1240 Organic Chemistry I

CHM 2220 Organic Chemistry II

CHM 5510 Chemical Synthesis Laboratory

CHM 7200 Organic Structures and Mechanisms

#### INVITED SEMINARS:

1. University of Rochester, Department of Chemistry, December 2, 2004
2. Vanderbilt University, Department of Chemistry and Chemical Biology, December 17, 2005
3. Wayne State University, Department of Chemistry, January 5, 2005
4. Michigan State University, Department of Chemistry, January 11, 2005
5. Princeton University, Department of Chemistry, January 13, 2005
6. University of Pennsylvania, Department of Chemistry, January 25, 2005
7. University of Toledo, Department of Chemistry, November 6, 2006
8. Northern Michigan University, Department of Chemistry, December 7, 2006
9. Michigan Technological University, Department of Chemistry, December 8, 2006
10. Eastern Michigan University, Department of Chemistry, November 9, 2007
11. Wayne State University, Department of Pharmaceutical Sciences, October 8, 2008
12. Oakland University, Department of Chemistry, November 12, 2008
13. University of Guelph, Department of Chemistry, November 5, 2009
14. Brock University, Department of Chemistry, November 6, 2009
15. Waterloo University, Department of Chemistry, December 10, 2009
16. University of Toronto, Department of Chemistry, December 11, 2009
17. National Cancer Institute, Frederick, Maryland, May 24, 2010
18. Food and Drug Administration, Baltimore, Maryland, May 25, 2010

19. University of Guelph, Department of Chemistry, December 12, 2010
20. Karmanos Cancer Institute, Molecular Biology & Genetics Program Meeting, December 14, 2010
21. Michigan State University, Department of Chemistry, March 2, 2011
22. National Institute for Allergy and Infectious Disease, Washington, D.C., October 3, 2011
23. Virginia Tech, Department of Chemistry, November 18, 2011
24. Temple University, Department of Chemistry, December 8, 2011
25. University of Toledo, Department of Chemistry & Chemical Engineering, December 19, 2011
26. Georgia State University, Department of Chemistry, January 17, 2012
27. Binghamton University, Department of Chemistry, February 10, 2012
28. University of Toledo, Department of Medicinal Chemistry, October 15, 2012
29. University of Toledo, Department of Immunology, February 18, 2013
30. University of Toledo, Department of Biochemistry and Cancer Biology, April 14, 2013
31. Indiana State University, Department of Chemistry and Physics, September 3, 2013
32. University of Arkansas, Department of Chemistry and Biochemistry, September 16, 2013
33. Henry Ford Health System, Josephine Ford Cancer Institute, November 17, 2013
34. Indiana University-Purdue University Indianapolis, Department of Chemistry, April 23, 2014
35. University of Toronto, Department of Chemistry, August 21, 2014
36. Vanderbilt University, Department of Chemistry, October 6, 2014
37. New Mexico State University, Department of Chemistry and Biochemistry, November 13, 2014
38. University of Texas, El Paso, Department of Chemistry, November 14, 2014
39. Cleveland State University, Department of Chemistry, November 21, 2014
40. University of Toledo, Department of Chemical Engineering, March 19, 2015
41. Northeastern University, Department of Chemistry and Chemical Biology, August 21, 2015
42. Old Dominion University, Department of Chemistry and Biochemistry, February 12, 2016
43. Aquinas College, Department of Chemistry, September 15, 2016
44. Youngstown State University, Department of Chemistry, November 4, 2016
45. Wilkes University Department of Pharmaceutical Sciences, November 29, 2016
46. Rensselaer Polytechnic Institute Department of Chemistry and Chemical Biology, February 16, 2017
47. Old Dominion University Departments of Biological Sciences & Chemistry & Biochemistry, March 24, 2017
48. University of Missouri – St. Louis Department of Chemistry and Biochemistry, September 18, 2017
49. Southern Illinois University Edwardsville Department of Chemistry, September 19, 2017
50. University of Notre Dame Department of Chemistry and Biochemistry, October 5, 2018
51. Case Western Reserve Department of Chemistry, November 8, 2018
52. Oakland University Department of Chemistry, March 27, 2018

#### CHAIRED EVENTS:

1. 14<sup>th</sup> Annual Midwest Carbohydrate and Glycobiology Symposium (09/21-09/22/2018) Michigan State University. Session Leader for Enzymatic Structure and Function.
2. 13<sup>th</sup> Annual Midwest Carbohydrate Symposium (09/22-09/23/2017) University of Wisconsin, Madison. Session Leader for Carbohydrate-based Immunogens.
3. 253<sup>rd</sup> ACS National Meeting in San Francisco, (04/03-07/2017), California, Grand Ballroom East - Grand Hyatt San Francisco, Session Leader for “Carbohydrate Awards Session”, April 3, 2017.
4. 28<sup>th</sup> International Carbohydrate Symposium (07/17-21/2016) New Orleans, LA, Session Leader for “Synthesis of Carbohydrates, Glycoconjugates & Glycan-based Biomaterials, July 19, 2016.
5. 10<sup>th</sup> Annual Midwest Carbohydrate Symposium (10/23-24/2015) Cleveland State University, Chaired Symposium Session, October 23, 2015.
6. GRC Carbohydrates (06/14-19/2015) Mount Snow, West Dover, VT. Discussion Leader of “Wonders of the Bacterial World”.
7. 9<sup>th</sup> Annual Midwest Carbohydrate Symposium (10/11-12/2013) The University of Toledo, Co-organizer for this event.

8. 8<sup>th</sup> Annual Midwest Carbohydrate Symposium (10/28-29/2012) Wayne State University, Co-organizer for this event.
9. 241<sup>st</sup> ACS National Meeting and Exposition (03/26-31/2011) Anaheim, CA. Session chair.
10. 241<sup>st</sup> ACS National Meeting and Exposition (03/26-31/2011) Anaheim, CA. Symposium Co-Organizer in conjunction with Prof. S. Sucheck from U of Toledo. Special time, Wednesday and Thursday 03/30 and 03/31. "Carbohydrate-based Immunotherapeutics". Highlighted in C&EN News – May 30, 2011 Issue. (Stu Borman - Deputy Assistant Managing Editor)
11. 4<sup>th</sup> Annual Midwest Carbohydrate Symposium (10/02-03/2009) University of Cincinnati, Cincinnati, OH. Chaired Symposium Session, October 3, 2009.
12. 237<sup>th</sup> ACS National Meeting and Exposition (03/22-26/2009) Salt Lake City, UT. Session chair for the Division of Carbohydrate Chemistry, March 25, 2009.
13. 232<sup>st</sup> ACS National Meeting and Exposition (09/09-14/2006) San Francisco, CA. Session chair of the New Reactions and Methodology for the Division of Organic Chemistry, September 12, 2006.
14. 2<sup>nd</sup> Annual Midwest Carbohydrate Symposium (09/29-30/2006) Wayne State University, Detroit, MI Co-organizer for this event.

#### MEMBERSHIPS:

American Chemical Society (1998 – )

American Association for the Advancement of Science (1999 – )

Phi Lambda Upsilon – Honorary Chemical Society (1999)

- WSU Chapter Secretary (1999 – 2000)
- WSU Chapter President (2000 – 2001)
- WSU Alumni Secretary (2001 – 2002)
- WSU Chapter Advisor (2005 – 2012)