

Abram J. Axelrod

Purdue University
Department of Chemistry
Department of Medicinal Chemistry and Molecular Pharmacology
Purdue Cancer Center
Purdue Institute for Drug Discovery
Purdue Institute of Inflammation, Immunology, and Infectious Disease

720 Clinic Drive
West Lafayette, IN 47907
Office: DRUG 247
Laboratory: DRUG 210/218
Phone: (765)-496-1182
Email: aaxelro@purdue.edu

Research and Professional Experience

- 7/2018-present **Assistant Professor**
Purdue University, West Lafayette, IN
Current research focuses on utilizing synthetic chemistry to interrogate problems in immunology and infectious diseases. Representative projects include activating immune cells through synthetically prepared biologics and the development of routes to chemoprotective natural products.
- 8/2013-6/2018 **Postdoctoral Fellow and Laboratory Manager**
Sloan Kettering Institute for Cancer Research
Memorial Sloan Kettering Cancer Center, New York, NY
Research Advisor: Professor Samuel J. Danishefsky
Research focused on the chemical synthesis of immunoglobulin glycoproteins for therapeutic use in autoimmune diseases, synthesis of mucin-16 glycopeptide epitopes to generate anti-ovarian cancer antibodies, synthesis of thyroid-stimulating hormone glycoforms for diagnostic purposes, and glycopeptide-focused synthetic methodologies.
MSKCC Teaching Fellow, Fall 2017
- 12/2012-5/2013 **Research Associate**
University of Texas at Austin, Austin, TX
Research Advisor: Professor Adrian T. Keatinge-Clay
Research focused on the development of chemoenzymatic reactions for polyketide synthesis, and preparation of probes for mechanistic studies of polyketide ketoreductases.
- 7/2003-5/2005 **Scientist I/II**
ArQule, Inc., Woburn, MA
Associate medicinal chemist in an oncology-based drug discovery company utilizing an automated solution-phase parallel synthesis platform.

Education

- 8/2007-11/2012 **Ph.D., Organic Chemistry**
University of Texas at Austin, Austin, TX
Research Advisor: Professor Dionicio R. Siegel
Hamilton-Schoch Fellow
Research focused on the total syntheses of the fungal polyketides vinaxanthone and xanthofulvin, which promote spinal cord regeneration, the neuroregenerative terpene-alkaloid complanadine A, and the development of phthaloyl peroxide-mediated oxidation reactions.
Thesis title: Total Synthesis of the Neuroregenerative Natural Products Vinaxanthone and Xanthofulvin and Biosynthetic Studies.

5/2005-5/2007

M.A., Chemistry

State University of New York at Buffalo, Amherst, NY

Research Advisor: Professor Michael R. Detty

Research focused on the synthesis of tellurium-based heterocycles for use in photodynamic chemotherapy.

Thesis title: Tellurium Heterocycles: New Tellurophenes and an Optimized Route.

8/1999-5/2003

B.A., Chemistry

Brandeis University, Waltham, MA

Advisor: Professor Bruce M. Foxman

Publications

12. **Axelrod, A.J.**[#]; Walkowicz, W.E.; Aussedat, B.; Roberts, A.R.; Danishefsky, S.J. Chemical Synthesis of a Fully Glycosylated Immunoglobulin G Fc Minibody. *Manuscript in Preparation*, ^{#denotes corresponding author}.
11. Eliassen, A.M.; Chin, M.R.; **Axelrod, A.**; Abagyan, R.; Siegel, D. Tissue Regeneration Through Allosteric Modulation of the Succinate Receptor by Vinaxanthone and Xanthofulvin. *Manuscript in Preparation*
10. Brailsford, J.A.^{*}; Stockdill, J.L.^{*}; **Axelrod, A.J.**[#]; Peterson, M.T.; Vadola, P.A.; Johnston, E.V.; Danishefsky, S.J. Total Chemical Synthesis of the β -Subunit of Thyroid Stimulating Hormone Enabled by Arginine Tagged Acetamidomethyl Solubilizing Groups. *Manuscript accepted - Tetrahedron*. ^{*}denotes co-first author, ^{#denotes corresponding author}.
9. Rao, T.D.^{*}; Fernandez-Tejada, A.^{*}; **Axelrod, A.**^{*}; Rosales, N.; Yan, X.; Thapi, S.; Wang, A.; Park, K.J.; Nemieboka, B.; Xiang, J.; Lewis, J.S.; Olvera, N.; Levine, D.A.; Danishefsky, S.J.; Spriggs, D. Antibodies Against Specific MUC16 Glycosylation Sites Inhibit Ovarian Cancer Growth *ACS Chemical Biology*, **2017**, *12*, 2085-2096. ^{*}denotes co-first author.
 - One of the most read articles from July-August 2017.
8. Chin, M.R.; Zlotkowski, K.; Han, M.; Patel, S.; Eliassen, A.M.; **Axelrod, A.**; Siegel, D. Expedited Access to Vinaxanthone and Chemically Edited Derivatives Possessing Neuronal Regenerative Effects through Ynone Coupling Reactions. *ACS Chemical Neuroscience*, **2015**, *6*, 542-550.
7. Piasecki, S.K.; Zheng, J.; **Axelrod, A.J.**; Detelich, M.; Keatinge-Clay, A.T. Structural and functional studies of a trans-acyltransferase polyketide synthase ketoreductase the performs both alpha- and beta-ketoreduction. *Proteins: Structure, Function, and Bioinformatics*, **2014**, *82*, 2067-2077.
6. Gay, D.C.; Gay, G.; **Axelrod, A.J.**; Jenner, M.; Kohlhaas, C.; Kampa, A.; Oldham, N.J.; Piel, J.; Keatinge-Clay, A.T. A Close Look at a Ketosynthase from a Trans-acyltransferase Modular Polyketide Synthase. *Structure*, **2014**, *22*, 444-51.
 - Selected as the cover article for the issue.
5. **Axelrod, A.**; Eliassen, A.M.; Chin, M.R.; Zlotkowski, K.; Siegel, D. Syntheses of Xanthofulvin and Vinaxanthone, Natural Products Enabling Spinal Cord Regeneration. *Angew. Chem. Int. Ed. Int. Eng.*, **2013**, *52*, 3421-3424.
 - Highlighted: "Synthesis of Xanthofulvin and Vinaxanthone." *SciBX* **2012**, *5* (44) doi:10.1038/scibx2012.1170.
 - "Total Syntheses of Xanthofulvin and Vinaxanthone." *Synfacts*, **2013**, *9*, 465.

4. Vidal-Gadea, A.; Topper, S.; Young, L.; Kressin, L.; Elbel, E.; Maples, T.; Brauner, M.; Erbguth, K.; **Axelrod, A.**; Gottschalk, A.; Siegel, D.; Pierce-Shimomura, J.T. *C. elegans* Selects Distinct Crawling and Swimming Gaits via Dopamine and Serotonin. *Proc. Natl. Acad. Sci., USA*. **2011**, *108*, (42), 17504-17509.
 - Highlighted: "One chemical makes you crawl, another makes you swim, if you are *C. elegans*." Scientific American Blog: <http://blogs.scientificamerican.com/scicurious-brain/2011/12/05/>.
3. Yuan, C.; **Axelrod, A.**; Varela, M.; Danysh, L.; Siegel, D. Synthesis and Reaction of Phthaloyl Peroxide Derivatives, Potential Organocatalysts for the Stereospecific Dihydroxylation of Alkenes. *Tetrahedron Lett.* **2011**, *52*, 2540-2542.
 - Highlighted: "Metal or No Metal: That Is the Question!" *Angew. Chem. Int. Ed.*, **2011**, *50*, 10495-10497.
2. Yuan, C.; Chang, C.-T.; **Axelrod, A.**; Siegel, D. Synthesis of Complanadine A, an Inducer of Neurotrophic Factor Excretion. *J. Am. Chem. Soc.* **2010**, *132*, 5924-5925.
 - Highlighted in "Symmetrizing the Unsymmetrical." *Nature*, 465, 560-561. "Making Complanadine A." *Chem. & Eng. News*, **2010**, *88* (17) 11.
 - "Total synthesis: Pseudosymmetry solved." *Nat. Chem.*, published April, 30th, 2010.
 - "Syntheses of (+)-Complanadine A." *Synfacts*, **2010**, *8*, 863.
1. Sathyamoorthy, B.; **Axelrod, A.**; Farwell, V.; Bennett, S.M.; Calitree, B.D.; Benedict, J.B.; Sukumaran, D.K.; Detty, M.R. Novel 21,23-Ditelluraporphyrins and the First 26,28- Ditellurasapphyrin and 30,33-Ditellurarubyrin. *Organometallics*, **2010**, *29*, 3431-3441.

Patents

1. Siegel, D.; Chin, M.; Eliassen, A.; **Axelrod, A.** "Methods of Synthesis of Analogs of Vinaxanthone and Xanthofulvin and Methods of Treatments Using Them." WO 2015021226 A1 20150212.
2. **Axelrod, A.**; Johnson, T.C.; Siegel, D.; Camelio, A.M., Yuan, C.; Eliassen, A. "Cyclic Peroxide Oxidation of Aromatic Compounds Production and Use Thereof." WO 2014158209 A1 20141002.
3. Siegel, D.; Eliassen, A.; Chin, M.; **Axelrod, A.** "Compositions and Methods for Regeneration by Small Molecule Modulation of GPR91." Provisional Patent Application No. 61/863,237.

Teaching Experience

Pharmacology I (Fall 2017) Memorial Sloan Kettering Cancer Center

Core pharmacology/chemical biology course for 1st year graduate students. Responsibilities include preparing organic chemistry lectures, problem sets and exams. Selected as an MSKCC Fall 2017 Teaching Fellow.

(with Professors Derek Tan and Minkui Luo)

CH204 (Spring 2011 – 1 section) UT Austin

Freshman Research Initiative – Bioprospecting, Isolation of Biologically Active Natural Products from Endophytes; Elective for advanced 1st year students. Coursework entailed fungal/bacterial cell culture, PCR, and modern techniques applied to the analysis of symbiotic plant organisms. Responsibilities included grading assignments and presentations.

(with Professor Dionicio Siegel, Dr. Marsha Lewis)

CH391 (Spring 2008 – 1 section) UT Austin

Advanced Topics in Organic Chemistry; Synthesis and mechanism elective covering total syntheses, retrosynthetic analysis, and named reactions.

Responsibilities included preparing lecture handouts and exams, and grading exams and presentations.

(with Professor Dionicio Siegel)

CH310/318 (Summer 2009/2010/2012, Fall 2009, Spring 2010 (1 section/semester) UT Austin

Organic Chemistry Lectures I/II; Introductory organic chemistry for chemistry major and non-majors.

Responsibilities included preparing and grading homework assignments, holding office hours and review sessions, and grading exams.

(with Professor Dionicio Siegel, Dr. Brian Bocknack)

CH210C (Fall 2007/2010/2012, Spring 2010 – 2 sections/semester) UT Austin

Organic Chemistry Laboratory I/II; Introductory organic chemistry laboratory covering fundamental organic reactions and analysis. Responsibilities included supervising students, holding office hours, and grading laboratory reports.

(with Dr. Conrad Fjetland)

Students Trained**University of Texas at Austin**

Anders Eliassen

Graduate student, U.T. Austin Ph.D., 2015 (Postdoctoral Fellow, CALIBR)

Matthew Chin

Graduate student, U.T. Austin Ph.D., 2015 (Research Scientist I, Gilead)

Aurpon Mitra

Graduate student, U.T. Austin M.A., 2011 (Senior Research Associate II, Gilead)

Saagar Patel

Undergraduate student, U.T. Austin B.S., 2014 (M.D. Candidate, Baylor Medical School)

Leah Ray

Undergraduate student, U.T. Austin B.S., 2012 (Ph.D. Candidate, Boston University)

Nicole Varnado

Undergraduate student, U.T. Austin B.S., 2010 (M.D./Ph.D. Candidate, U.T. Southwestern)

Sloan Kettering Institute

Andrew Griswold

M.D./Ph.D. Candidate, Weill-Cornell Medical School/Sloan Kettering Institute (Bachovchin Lab)

Outreach – Texas Shamans (University of Texas at Austin/Lady Bird Johnson Wildflower Center)

Texas Shamans was an outreach program developed for high school students in the Austin, TX area integrating ethnobotany and natural product isolation from local flowers and plants. In addition to learning basic organic chemistry laboratory techniques (TLC, column chromatography), the students attended lectures on the medicinal relevance of the local plants and flowers and which active constituents were used in modern medicines. The students presented their work at the Lady Bird Johnson Wildflower Center and submitted a written report at the end of the two-week program. I served as a graduate student mentor (2009-2011) supervising 20 students each year, demonstrating organic chemistry techniques and assisting them with their presentations.