Andrew K. Udit

Curriculum vitae

Occidental College, Department of Chemistry
1600 Campus Road, Los Angeles CA 90041

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SUMMARY

Teaching philosophy. The pursuit of science as a lifelong investigative endeavor demands constantly questioning, discovering, and re-evaluating existing paradigms in the light of new knowledge.

Research Focus. Using chemistry to address biological questions, with emphasis on: 1) heparin alternatives and antagonists using virus nanoparticles; 2) heme-driven biocatalysis.

Mission. Revealing to students the relevance of science in their everyday life through teaching and researching with emphasis on hands-on, interactive, self-relevant experiences, typically accomplished using personal health and nutrition examples.

EDUCATION

Canadian Institutes of Health Research (CIHR) Fellow and Research Associate in Chemical Biology, under M.G. Finn
The Scripps Research Institute, Jun 2006 to Aug 2008, La Jolla, CA

Howard Hughes Medical Institute (HHMI) Teaching and Research Fellow, Occidental College, under M.G. Hill
Occidental College, Jun 2005 to Jun 2006, Los Angeles, CA

Ph.D., Chemistry, under F.H. Arnold and H.B. Gray
California Institute of Technology, Jun 2005, Pasadena, CA

Honours B.Sc., Chemistry and Biochemistry, under P.M. Macdonald; Minor, Physics; Cumulative GPA 3.93 (High Distinction)
University of Toronto, May 2000, Toronto, Ontario

RELEVANT WORK EXPERIENCE

Associate Professor of Chemistry, Occidental College
Aug 2014 to present, Los Angeles, CA

- Designing, developing, and instructing General Chemistry lectures and labs
    - First semester freshman course focuses on molecular structure and spectroscopy (e.g., IR spectroscopy, diffraction using lasers, ICP to analyze cigarette smoke)
    - Second semester course (incorporating freshman to seniors) focuses on analytical techniques, emphasizing topics in equilibrium and kinetics with biological examples (e.g., kinetics of fluoride binding to myoglobin using electronic absorption spectroscopy, analysis of iron in vitamins using ICP)
- Creating, developing, and instructing a recurring class in the college's Cultural Studies Program that emphasizes stimulating and challenging critical thinking
    - Focus on media portrayal of science and public (mis)understanding

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  - Emphasize student development in writing with several analytical essays, and presentation skills that require classroom engagement to stimulate discussion
  - Incorporate community outreach elements (campus-wide virus-coated hot dog experiment, community surveys to probe public knowledge of biotech, public awareness events to promote knowledge of pesticide use)
- Conducting independent research funded by external grants, and publishing papers with undergraduate students
  - Coordinate, manage, and lead an undergraduate research group (8-20 students)
  - Oversee student participation in designing assays, running experiments, and forming research questions based on experimental data
  - Projects explore: 1) developing electrode-driven hydrocarbon oxidation catalysts using biological heme systems; 2) exploiting virus nanoparticles that may either antagonize or substitute for clinical heparin

Assistant Professor of Chemistry, Occidental College
Aug 2008 to August 2014, Los Angeles, CA

Columnist and Exhibits Presenter / Interpreter, Birch Aquarium at Scripps Institution of Oceanography
Jun 2006 to Aug 2008, La Jolla, CA
- Contributed science-related articles as the "Ask a Chemist" columnist to the aquarium's monthly newsletter, *The High Tide Times*
  - Article topics were driven by common visitor questions
- Educated visitors about marine life and conservation
  - Conducted hands-on demonstrations during various events (Kelp Day, Shark Week, etc.)
  - Assisted with guiding field trips (e.g., whale watching, grunion run)
- Participated in various workshops (e.g., how to educate the public on climate change)

Teaching and Research Fellow, Occidental College
Jun 2005 to Jun 2006, Los Angeles, CA
- Conducted independent research and published several papers with five to seven undergraduates students
  - DNA-mediated electrochemistry of nucleic acid intercalators
  - Thermodynamic investigations of P450 cytochromes on electrode surfaces
- Taught undergraduate classes with focus on developing course material in bioinorganic chemistry

Mentor, Summer Undergraduate Research Fellowship Program, California Institute of Technology
Summer 2003, Pasadena, CA
- Developed and supervised a research project for an undergraduate student involving synthetic chemistry, electrochemistry, and protein biophysics

Senior Teaching Assistant, Chemistry Department, California Institute of Technology
Aug 2000 to Dec 2003, Pasadena, CA
- Organized and instructed two laboratory classes: Introduction to Chemistry and Analytical Chemistry

President, Erindale Chemistry and Physics Society, University of Toronto
May 1999 to May 2000, Toronto, Ontario
- Managed the Executive Committee
- Provided tutorials and social events for students, organized field trips to research institutes, and invited guest lecturers.

Teaching Assistant, Physics Department, University of Toronto
Sept 1999 to May 2000, Toronto, Ontario

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Tutor and Mentor in Physics and Chemistry, Academic Skills Center, University of Toronto
Sept 1998 to May 2000, Toronto, Ontario

Private Mathematics Tutor
1996 to 2000, Mississauga, Ontario

Safety Officer, Arnold Research Group, California Institute of Technology
Sept 2002 to Aug 2004, Pasadena, CA

- Maintained a safe working environment: proper waste disposal, chemical storage, maintained emergency and First Aid kits, trained new lab members in safety practices

OTHER WORK EXPERIENCE

Visiting Scientist, California Institute of Technology
Feb 2011 to present, Pasadena, CA

Research Associate, The Scripps Research Institute
Jun 2006 to Aug 2008, La Jolla, CA

Graduate Student, California Institute of Technology
Aug 2000 to Jun 2005, Pasadena, CA

Undergraduate Student Research, University of Toronto
May 1999 to Jun 2000, Toronto, Ontario

Freshwater and Marine Aquarist, Big Al's Aquarium Services
May 1997 to Jan 2000, Mississauga, Ontario

Emergency Room Volunteer, Queensway General Hospital
Apr 1997 to Jun 1999, Toronto, Ontario

Legislative Page, Ontario Legislature
Fall of 1991, Toronto, Ontario

RESEARCH SUPPORT

National Science Foundation (AKU principal investigator), 09/2014 – 08/2018, $150,000
Exploiting biophysical techniques to understand and manipulate the mechanism and activity of electrode-bound cytochrome P450. The project aims to understand the aberrant electrochemical properties displayed by P450 when bound to an electrode surface. A combination of electrochemical, spectroscopic, calorimetric, and bio-layer interferometry will be used to examine the nature of P450 when bound to the electrode.

Research Corporation Multi-Investigator Cottrell College Science Award (AKU principal investigator, MG Hill co-PI), 07/2014 – 06/2017, $75,000
Wired P450 electrodes for bioelectrocatalysis. The project aims to discover electron-transfer pathways in cytochrome P450 that can be exploited via "wiring" the enzyme to an electrode to achieve heme reduction and electrode-driven catalysis. In addition to providing new information on electron-transfer mechanisms and pathways in P450, a system capable of metabolite detection and/or chemical synthesis may be achievable.

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Henry Luce Foundation, Occidental-China Environment Initiative, 05/2012 – 11/2016, $7,500
This course development grant was awarded to support investigation into sustainability challenges faced by the emerging Chinese society, and the impact that proposed solutions will have on both China and the world. The goal is to incorporate the outcomes of the research into two freshman classes (General Chemistry lab, and Science and You writing class). The purpose is to illuminate freshman early in their academic career how seemingly disparate societies face similar challenges at different points in their history and development. Solutions are influenced by available technologies and government/society agendas and willingness, thus every society – China included – will deal with such challenges differently with global consequences given how interconnected today's world is.

American Chemical Society Petroleum Research Fund Undergraduate New Investigator Award (AKU principal investigator), 05/2009 – 08/2013, $50,000
Bioelectrochemical hydrocarbon oxidation using engineered P450 cytochromes. The project aims to engineer P450 cytochromes to accept artificial cofactors for in vitro electrochemically-driven biocatalysis. The engineered systems can be used for the synthesis of fine chemicals or exploited in pharmaceutical drug screening. Specific duties involving experimental design included: Designing and generating mutants by PCR, developing screening protocols (colorimetric and GCMS assays) for monitoring substrate turnover, engineering an electrochemical reactor for conducting turnover experiments.

Camille and Henry Dreyfus Foundation Faculty Start-up Award (AKU principal investigator), 09/2008 – 09/2013, $30,000
Heparin mimics for chemotherapy using polyvalent displays on virus particles. This exploratory grant has been used to fund general research into virus nanoparticles. Work has focused on developing viruses that act as antagonists for heparin anticoagulant activity. Experiments have involved computational modeling to design mutants with heparin-binding sites, molecular biology techniques to generate the mutants, and various clinical assays to test for anticoagulant activity.

Research Corporation Cottrell College Science Award (AKU principal investigator), 05/2010 – 08/2013, $35,000
Targeting sulfated ligands to unnatural amino acids on virus platforms for generation of polyvalent nanoparticles with heparin-like activity. The project aims to develop structurally-defined polyvalent sulfated materials that elicit physiological responses similar to heparin with the goal of determining which sulfated structures act as potent activators/inhibitors of carcinogenic activity. Efforts have been largely directed towards the synthesis of various sulfated molecules using modified protocols from the literature and standard characterization techniques (NMR, ESI-MS, TLC). Undergraduate researchers perform the majority of the syntheses under the direction of AKU.

SELECTED AWARDS AND HONOURS

- Canadian Institutes of Health Research Fellow. The Scripps Research Institute – July 2007 to Aug 2008
- Society of Fellows Award for Research. The Scripps Research Institute – Oct 2007
- Howard Hughes Medical Institute Fellow. Occidental College – Jun 2005 to Jun 2006
- Natural Sciences and Engineering Research Council of Canada (NSERC) Post Graduate Scholarship. California Institute of Technology – May 2001 to Jun 2005
- Willits Foundation Scholarship. California Institute of Technology – Sept 2000 to Jun 2001
- E.A. Robinson Medal for the highest Cumulative GPA. University of Toronto – Jun 2000
- Willits Foundation Scholarship. University of Toronto – Sept 1999 to May 2000
- Peter Hein Award in Physics. University of Toronto – Mar 2000
- NSERC Undergraduate Student Research Award. University of Toronto – Jun 1999 to Aug 1999
- Hudson's Bay Scholarship. University of Toronto – Dec 1999

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- Admissions Scholarship. University of Toronto – Sept 1999, Sept 1998, Sept 1997, Sept 1996
- Dean's Honour List. University of Toronto – Sept 1999, Sept 1998, Sept 1997
- Principal's Certificate recognizing volunteer work. University of Toronto – May 1999
- City of Mississauga Pope John Paul 11 Scholarship. University of Toronto – Sept 1996
- Governor General's Academic Medal Award. Philip Pocock Catholic Secondary School – Jun 1996
- Member of the American Chemical Society
- Member of the Council on Undergraduate Research

COURSES AND WORKSHOPS COMPLETED

Cottrell Scholars Collaborative Academic Leadership Training Workshop. Washington, D.C., Feb 2018.

Luce Initiative on Asian Studies and the Environment (LIASE) Conference. Meeting of Luce Foundation grant recipients to discuss best practices, challenges, and paths forward for engaging students with global environmental issues. St. Paul, MN, Sept 2017.

International faculty development seminar (via CIEE): "Toward urban sustainability: A South African case study" Stellenbosch, South Africa, Jan 5-15, 2014.

Occidental College workshop: "iPad Faculty Learning Community", aimed at exploring the use of the iPad in teaching and research. Occidental College, 2012.

Caltech workshop: "How to turn an idea for a class into a series of lectures." California Institute of Technology, May 25, 2011.

ACS Short Course: Formulation Development and Drug Delivery Systems for Therapeutic Proteins American Chemical Society, La Jolla, CA, Dec 4-6, 2008.

ACS Summer Program on Green Chemistry and Sustainability. American Chemical Society, Golden, CO, July 9-17, 2008.

Science Writing Workshop. San Diego Science Writers Association, May 12, 2007.

PUBLICATIONS AND PRESENTATIONS

Publications (**undergraduate researchers**, *AKU corresponding author)

1. ***JM Choi**, **V Bourassa**, **K Hong**, **M Shoga**, **EY Lim**, **A Park**, **K Apaydin**, AK Udit. Polyvalent hybrid virus-like nanoparticles with displayed heparin antagonist peptides. *Molecular Pharmaceutics* (2018) 15(8):2997-3004.
2. ***AK Udit (Editor). *Methods in Molecular Biology: Protein Scaffolds: Design, Synthesis, and Applications.* Springer (2018).
3. ***HY Cheong**, **M Groner**, **K Hong**, **B Lynch**, **WR Hollingsworth**, Z Polonskaya, J-K Rhee, MM Baksh, MG Finn, AJ Gale, AK Udit. Heparin binding to an engineered virus-like nanoparticle antagonist. *Biomacromolecules* (2017) 18:4113-4120.
4. HM Segal, T Spatzal, MG Hill, AK Udit, DC Rees. Electrochemical and structural characterization of *Azotobacter vinelandii* flavodoxin II. *Protein Science* (2017) 26:1984-1993.
5. ***J Kallick**, **S Harris**, AK Udit, MG Hill. A spin-column for heterogeneous bioconjugation via azide-ethynyl coupling in aqueous solution. *Biotechniques* (2015) 59(6):329-334.
6. ***M Groner**, **T Ng**, W Wang, AK Udit. Bio-layer interferometry studies of a sulfated virus-like nanoparticle with anticoagulant activity. *Anal. Bioanal. Chem.* (2015) 407(19):5843-5847.

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7. AK Udit, MG Hill, HB Gray. "Electrochemical activation of cytochrome P450" in *Electrochemical Processes in Biological Systems*; A Lewenstam and Lo Gorton, Ed.; John Wiley and Sons, Inc., Hoboken NJ (2015).
8. ***G Mead**, **M Hiley**, **T Ng**, **C Fihn**, **K Hong**, **M Groner**, **W Miner**, **D Drugan**, **W Hollingsworth**, AK Udit. Directed polyvalent display of sulfated ligands on virus nanoparticles elicits heparin-like anti-coagulant activity. *Bioconjugate Chemistry* (2014) 25(8):1444-1452.
9. ***KD Hagen**, **JM Gillan**, **S Landefeld**, **G Mead**, **M Hiley**, S-C Im, LA Waskell, MG Hill, AK Udit. Electrochemistry of mammalian cytochrome P450 2B4 indicates tunable thermodynamic parameters in surfactant films. *J. Inorg. Biochem.* (2013) 129:30-34
10. *****AK Udit, MG Hill. "Bioelectrocatalysis with P450 cytochromes" in *Advances in Chemistry Research*; JC Taylor, Ed.; Nova Science Publishers (2013) Vol. 19, pg 25-54.
11. AK Udit, MG Hill, JR Winkler, HB Gray. Electron flow through iron and copper proteins. *Bulletin of Japan Society of Coordination Chemistry* (2011) 57:1-12.
12. AJ Gale, DJ Elias, PM Averell, PS Teirstein, M Buck, SD Brown, Z Polonskaya, AK Udit, MG Finn. Engineered virus-like nanoparticles reverse heparin anticoagulation more consistently than protamine in plasma from heparin-treated patients. ***Thrombosis Research*** (2011) 128:e9-e13.
13. ***C van der Felt**, **K Hindoyan**, **K Choi**, **N Javdan**, **P Goldman**, R Bustos, BM Hunter, MG Hill, A Nersissian, AK Udit. Electron-transfer rates govern product distribution in electrochemically-driven P450-catalyzed dioxygen reduction. *J. Inorg. Biochem.* (2011) 105:1350-1353.
14. R Astronomo, E Kaltgard, AK Udit, S-K Wang, KJ Doores, C-Y Huang, R Pantophlet, JC Paulsen, C-H Wong, MG Finn, D Burton. Defining criteria for oligomannose immunogens for HIV using icosahedral virus capsid scaffolds. *Chemistry and Biology* (2010) 17:357-370.
15. *****AK Udit, CPR Hackenberger, MK O'Reilly. Chemically tailored multivalent virus platforms – from drug delivery to catalysis. *ChemBioChem* (2010) 11:481-484.
16. *****AK Udit, **W Hollingsworth**, **K Choi**. Metal- and metallocycle-binding sites engineered into polyvalent virus-like scaffolds. *Bioconjugate Chemistry* (2010) 21:399-404.
17. AK Udit, C Everett, AJ Gale, J Reiber-Kyle, M Ozkan, MG Finn. Heparin Antagonism by Polyvalent Display of Cationic Motifs on Virus-Like Particles. *ChemBioChem* (2009) 10:503-510.
18. *****AK Udit, S Brown, MM Baksh, MG Finn. Immobilization of bacteriophage Qβ on metal-derivatized surfaces via polyvalent display of hexahistidine tags. *J. Inorg. Biochem.* (2008) 102:2142-2146.
19. V Hong, AK Udit, MG Finn. Electrochemically Protected Copper(I)-Catalyzed Azide-Alkyne Cycloaddition. *ChemBioChem,* (2008) 9:1481-1486.
20. DE Prasuhn Jr., J Kuzelka, AK Udit, E Strable, GC Lander, JD Quispe, A Zlotnick, C Potter, B Carragher, MG Finn. Polyvalent display of heme on hepatitis B virus capsid protein through coordination to hexahistidine tags. *Chemistry and Biology,* (2008) 15(5):513-519.
21. E Strable, DE Prasuhn Jr., AK Udit, SD Brown, AJ Link, JT Ngo, G Lander, J Quispe, CS Potter, B Carragher, DA Tirrell, MG Finn. Unnatural Amino Acid Incorporation into Virus-like Particles. *Bioconjugate Chem.* (2008) 19:866-875. **Featured on the cover.**
22. AK Udit, SM Contakes, HB Gray. "P450 Electron Transfer Reactions" in *Metal Ions in Life Sciences*; A. Sigel, H. Sigel, R.K.O. Sigel, Eds.; John Wiley & Sons (2007) Vol. 3, pp. 157-185.
23. DM Ceres, AK Udit, **HD Hill**, MG Hill, JK Barton. Differential Ionic Permeation of DNA-Modified Electrodes. *J. Phys. Chem. B* (2007) 111:663-668.
24. AK Udit, MG Hill, HB Gray. Electrochemistry of Cytochrome P450 BM3 in Sodium Dodecyl Sulfate Films. *Langmuir* (2006) 22: 10854-10857.
25. AK Udit, **KD Hagen**, **PJ Goldman**, **A Star**, **JM Gillan**, HB Gray, MG Hill. Spectroscopy and electrochemistry of Cytochrome P450 BM3-Surfactant Film Assemblies. *J. Am. Chem. Soc.* (2006) 128: 10320-10325.
26. AK Udit, MG Hill, HB Gray. Electrochemical Generation of a High-valent state of Cytochrome P450. *J. Inorg. Biochem.* (2006) 100: 519-523.
27. AK Udit, HB Gray. Electrochemistry of Heme-Thiolate Proteins. *Biochem. Biophys. Res. Commun.* (2005) 338: 470-476.
28. AK Udit, W Belliston-Bittner, EC Glazer, YHL Nguyen, **JM Gillan**, MG Hill, MA Marletta, DB Goodin, HB Gray. Redox Couples of Inducible Nitric Oxide Synthase. *J. Am. Chem. Soc.* (2005) 127: 11212-11213.

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29. AK Udit, **N Hindoyan**, MG Hill, FH Arnold, HB Gray. Protein-Surfactant Film Voltammetry of Wild Type and Mutant Cytochrome P450 BM3. *Inorg. Chem.* (2005) 44: 4109-4111.
30. AK Udit, MG Hill, VG Bittner, FH Arnold, HB Gray. Reduction of dioxygen catalyzed by pyrene-wired heme domain cytochrome P450 BM3 electrodes. *J. Am. Chem. Soc.* (2004) 126: 10218-1021.
31. AK Udit, FH Arnold, HB Gray. Cobaltocene-mediated catalytic monooxygenation using holo and heme domain cytochrome P450 BM3. *J. Inorg. Biochem.* (2004) 98: 1547-1550.
32. N Mackinnon, KJ Crowell, AK Udit, PM Macdonald. Aluminum Binding to Phosphatidylcholine Lipid Bilayer Membranes: ^{27}Al and ^{31}P NMR Spectroscopic Studies. *Chem. Phys. Lipids.* (2004) 132: 23-36.
33. AK Udit, JJ Silberg, V Sieber. "Sequence Homology-Independent Protein Recombination (SHIPREC)" in *Methods in Molecular Biology: Directed Evolution Library Creation*; FH Arnold, G Georgiou, Eds.; Humana Press (2003) Vol. 231, pp 153-163.

Patents

- "Methods, compositions, and kits using heterogeneous catalysts". (2018) U.S. Patent Number 9,879,044.

Presentations

- "Surfactant film voltammetry of bacterial and mammalian cytochromes P450 suggests tunable, film-dependent properties." ***Poster***, 11th European Symposium on Electrochemical Engineering. Prague, Czech Republic. June 4-8, 2017.
- "Can the properties and activity of P450 be tuned within surfactant films on carbon electrodes?" ***Poster***, 26th Anniversary World Congress on Biosensors. Gothenburg, Sweden. May 25-27, 2016.
- "Directed polyvalent display of sulfated ligands on virus nanoparticles elicits heparin-like anti-coagulant activity". ***Seminar***, IUPAC 45th World Chemistry Congress. Busan, South Korea. August 11, 2015.
- "Virus nanoparticles that perturb coagulation". ***Invited seminar***, California State University Long Beach. Apr 15, 2015.
- "Electrochemistry of cytochromes P450 in surfactant films: tunable catalysts?" ***Seminar***, EuroBIC 12. Zurich, Switzerland. Aug 27, 2014.
- "Catalysis and coagulation: chemical approaches to biological problems". ***Invited seminar***, Claremont McKenna College. Apr 1, 2014.
- "Virus nanoparticles that perturb the heparin-coagulation mechanism". ***Invited seminar***, 247th national meeting of the American Chemical Society. Dallas, TX. March 18, 2014.
- "Electron-transfer rates govern product distribution in "wired" P450 electrodes". ***Seminar***, IUPAC 44th World Chemistry Congress. Istanbul, Turkey. August 12, 2013.
- "Engineered virus-like heparin antagonist nanoparticles". ***Seminar***, 35th Annual International Conference of the IEEE Engineering in Medicine and Biology Society. Osaka, Japan. July 5, 2013.
- "Pyrene-wired P450 electrodes". ***Seminar***, 223rd meeting of The Electrochemical Society; Toronto, Ontario. May 14, 2013.
- "Viruses: a multivalent playground for chemists". ***Invitation to teach mini-course***, Freie Universitat Berlin, Germany. Oct 16-19, 2012.
- "A hybrid virus-like nanoparticle heparin antagonist". ***Poster***, 6th International Conference on Bioinformatics and Biomedical Engineering. Shanghai, China. May 16-20, 2012.
- "Virus nanoparticles that catalyze and cure". ***Invited seminar***, Pomona College. Apr 3, 2012.
- "Virus nanoparticles that antagonize heparin". ***Poster***, Glycobiology Gordon Research Conference. Il Ciocco, Italy. May 8-13, 2011.
- "Cationic motifs displayed on polyvalent virus nanoparticles that antagonize heparin". ***Poster***, South Eastern Regional Meeting of the American Chemical Society. San Juan, PR. Oct 21-24, 2009.
- "Heparin Antagonism via Polyvalent Display of Cationic Motifs on Virus Platforms". ***Seminar***, Great Lakes Regional Meeting of the American Chemical Society. Chicago, IL. May 15, 2009.
- "Polyvalent Display of Cationic Motifs on Bacteriophage Qβ with anti-Heparin Activity". ***Seminar***, 91st Canadian Chemistry Conference and Exhibition. Edmonton, Alberta, Canada. May 26, 2008.

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- "Generating AIDS Vaccines with Targeted Polyvalent Oligomannose Displays on Virus Scaffolds via "Click" Bioconjugation to Non-natural Amino Acids". ***Poster***, 41st Western Regional Meeting of the American Chemical Society. San Diego, CA. Oct 11, 2007.
- "Arraying Oligomannose on Virus Scaffolds via "Click" Bioconjugation to Non-natural Amino Acids for AIDS Vaccines". ***Seminar***, The Scripps Research Institute, Society of Fellows Research Symposium. La Jolla, CA. Oct 4, 2007.
- "Generating AIDS Vaccines with Targeted Polyvalent Oligomannose Displays on Virus Scaffolds via "Click" Bioconjugation to Non-natural Amino Acids". ***Poster***, 13th European Congress on Biotechnology. Barcelona, Spain. Sept 16-19, 2007.
- "Expanding the Bioconjugation Toolbox with Unnatural Amino Acids". ***Seminar***, MontDiego Research Conference. Montana State University, Bozeman, MT. Mar 23, 2007.
- "Thermodynamics of Cytochrome P450 BM3 in DDAB films on Carbon Electrodes". ***Poster***, 40th Western Regional Meeting of the American Chemical Society. Anaheim, CA. Jan 25, 2006.
- "Protein-Surface Voltammetry of Wild Type and Mutant Cytochrome P450 BM3". ***Seminar***, 207th Meeting of the Electrochemical Society. Quebec City, Quebec, Canada. May 17, 2005.
- "Redox Couples of Inducible Nitric Oxide Synthase". ***Seminar***, Nitric Oxide Gordon Research Conference. Il Ciocco, Italy. May 25, 2005.
- "Pyrene-Wired Cytochrome P450 BM3 Electrodes". ***Poster***, 207th Meeting of the Electrochemical Society. Quebec City, Canada. May 16, 2005
- "Redox Couples of Inducible Nitric Oxide Synthase". ***Poster***, Nitric Oxide Gordon Research Conference. Il Ciocco, Italy. May 25-26, 2005.
- "Libraries of Hybrid Proteins from Distantly Related Sequences". ***Poster***, International Business Communications conference. San Diego, CA. Feb 26-28, 2001.

Other Conference Papers and Abstracts

- **AK Udit.** Engineered virus-like nanoparticle heparin antagonists. ***35th Annual International Conference of the IEEE EMBS*** (2013), pg 4118-4120.
- **AK Udit**. Heparin-antagonist virus-like nanoparticles. ***Siriraj Medical Journal*** (2012) 64(6):A-28.
- N Schmidt, SBarr, **AK Udit**, L Gutierrez, T Nguyen, MG Finn, E Luijten, G Wong. Structural transitions in condensed colloidal virus phases. ***Bulletin of the American Physical Society*** (2010) 55(2).
- N. Halpern-Manners, S.M. Contakes, **A.K. Udit**, A.J. DiBilio, H.B. Gray, J.R. Winkler. Photooxidation of cytochrome P450cam using nanosecond electron tunneling wires. ***Abstr. Pap. Am. Chem. Soc.*** 229: U1047-U1048, 557-INOR. Mar 13, 2005.
- C.A. Martinez, **A.K. Udit**, V. Sieber, F.H. Arnold. Libraries of Hybrid Proteins from Distantly Related Sequences. ***Abstr. Pap. Am. Chem. Soc.*** 221: U133-U133, 157-BIOT. Apr 1, 2001.

Other Publications

- "Calling in the Bioelectrician". **Feature article on AK Udit** appearing in the 12/8/17 issue of ***Scientia***.
- "Viruses: Natural Alternatives for Food Safety" appearing in the 3/7/11 issue of the ***Pasadena Star News***, Pasadena, CA.
- Articles for the "Ask A Chemist" column appearing in ***The High Tide Times***, *Birch Aquarium at Scripps, La Jolla, CA, U.S.A.*
    - "Why are "fatty" fish good for me?", Mar/Apr 2008 issue
    - "Can people eat it?", Jan/Feb 2008 issue
    - "What's that pufferfish poison, tetra-whazzit?", Nov/Dec 2007 issue
    - "Do fish see in color?", Sept/Oct 2007 issue
    - "How much CO_2 do cars produce?", July/Aug 2007 issue
    - "Are sea anemones poisonous?", May/Jun 2007 issue
    - "Are Human Activities Responsible for Global Warming?", Mar/Apr 2007 issue
    - "How do fish survive the cold?", Jan/Feb 2007 issue
    - "Are rising levels of carbon dioxide bad for the oceans?", Nov/Dec 2006 issue
    - "How does the nitrogen cycle affect an aquarium?", Sept/Oct 2006 issue

- "A tour through Birch Aquarium" appearing in the July 2006 issue, ***The Trolley Times***, San Diego, CA.

RESEARCH STUDENTS MENTORED

Occidental College Undergraduates

1. Ali Vogelaar (2017-present)
2. Andrew Park (2017-present)
3. Atnasia Mekonnen (2017-present)
4. Ayanna Lynch (2017-present)
5. Crystal Liang (2017-present)
6. Elleni Bekele (2017-present)
7. Patrick (John) Bender (2017-present)
8. Lauren Chin (2017-preset)
9. Nakiyah (Nikki) Scott (2017-present)
10. Spencer Raub (2017-present)
11. Kazim Apaydin (2017-2018)
12. Joseph Najjar (2016-2018)
13. Michael George (2016-2018)
14. Annie Rorick (2016-2018)
15. Michael Shoga (2016-2018)
16. Elizabeth Lim (2016-2018)
17. Danica Gressel (2016-2018)
18. Audrey Shawley (2016-2018)
19. Samuel (Luke) Schulert (2015-2018)
20. Zulema Iboa-Garcia (2014-2017)
21. Chandler Smith (2016-2017)
22. Eric Moll (2015-2017)
23. Emily Ong (2015-2017)
24. Colin McCully (2014-2017)
25. Ariana Rowshan (2014-2017)
26. Kiana Rowshan (2014-2017)
27. Ashley Andreou (2014-2017)
28. Justin Choi (2014-2017)
29. Whi-Inh (Shirley) Bae (2014-2017)
30. Robert George (2013-2016)
31. Preston Lee (2012-2015)
32. Myles Groner (2012-2015)
33. Taryn Ng (2012-2015)
34. Nirjhar Mundkur (2012-2014)
35. Megan Hiley (2012-2014)
36. Valerie Bourassa (2012-2014)
37. Kevin Hong (2011-2014)
38. Griffin Mead (2011-2014)
39. Candice Crilly (2012-2013)
40. Walker Miner (2011-2013)
41. Marielle Galanto (2011-2013)
42. Conrad Fihn (2009-2013)
43. Ho Yong (Sam) Cheong (2009-2013)
44. Samuel Rogers (2008-2012)
45. Brennen Lynch (2009-2012)

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46. William Hollingsworth (2008-2012)
47. Cameron Westbury (2009-2011)
48. Daniel Drugan (2008-2010)
49. Kang Choi (2008-2010)
50. Nikhil Addleman (2008-2009)
51. Andrew Star (2005-2009)
52. Peter Goldman (2005-2006)
53. Katharine Hagen (2005-2006)
54. James Gillan (2005-2006)
55. Nazafarin Javdan (community college transfer student, summer 2005)
56. Nareen Hindoyan (2003-2005)
57. Bridgett Sabat (2003)

TSRI Graduate Students
- Vu Hong (2006-2007)

TSRI Interns
- Chris Everett (high-school teacher) (summer 2007)

Caltech Undergraduates
- Nick Halpern-Manners (co-mentored with S.M. Contakes) (2003-2005)
- Kevin Peng; summer research student under Caltech SURF program (2003)

Other Students
- Cristine Eun Roh (high school student, summer 2014)
- Rose Bustos (CSULA graduate student, 2008-2011)
- Chi Ting Fung (exchange student, Leiden University, summer 2009)

Other Individuals
- Dr. Asmik Osganesyan (researcher, Glendale Community College)

Student Conference Presentations
1. J. Najjar. “Asymmetric cobalticenium molecules for mediated electrochemical biocatalysis.” **Poster** presentation, Southern California Conference on Undergraduate Research, Cal Poly Pomona, Nov 2017.
2. A. Rorick. “Novel anticoagulants using sulfated dendrons on virus-like particles.” **Poster** presentation, Southern California Conference on Undergraduate Research, Cal Poly Pomona, Nov 2017.
3. A. Rorick. “Generating a heparin substitute using sulfated virus nanoparticles.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2017.
4. S. (Luke) Schulert. “Probing cytochrome P450 biocatalysis via redox titrations.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2017.
5. J. Najjar. “Asymmetric cobaltocenium molecules for mediated electrochemical biocatalysis.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2017.
6. D. Gressel. “Cobaltocinium derivatives as mediators for biocatalysis with P450 enzymes.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2017.
7. C. Smith. “Developing a one-step method for bioconjugation reactions using CLICK chemistry.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2017.
8. W-I (Shirley) Bae. “Cobaltocenium derivatives as mediators for bioelectrochemical catalysis with P450.” **Poster** presentation, 253rd ACS National Meeting, San Francisco CA, Apr 2017.
9. M Shoga. “Virus particles that perturb coagulation.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2016.

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10. A Rowshan. “Probing cytochrome P450 bioelectrocatalysis with redox titrations.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2016.
11. E Moll. “Generating a heparin substitute using sulfated virus nanoparticles.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2016.
12. C McCully. “Cobalticinium derivatives as P450 mediators for synthesis of fine chemicals and pharmaceuticals.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2016.
13. J Choi. “Reversing heparin-induced anticoagulation using a virus nanoparticle.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2016.
14. WH (Shirley) Bae. “Cobaltocenium derivatives as mediators for bioelectrochemical catalysis with P450.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2016.
15. R. George. “Investigating the potential of cobalticinium derivatives as surrogate mediators for reactions involving P450.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2015.
16. A Rowshan. “Redox titrations of cytochrome P450.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2015.
17. Z Iboa-Garcia. “Understanding the mechanism of electrode-bound cytochrome P450 for biocatalysis.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2015.
18. M Groner. “Biophysical properties and mechanism of heparin antagonist virus-like nanoparticles.” **Oral** presentation, Southern California Conference of Undergraduate Research. Cal. State Fullerton, Nov 2014.
19. T Ng. “Directed polyvalent display of sulfated ligands on virus nanoparticles elicits heparin-like anticoagulant activity.” **Oral** presentation, Southern California Conference of Undergraduate Research. Cal. State Fullerton, Nov 2014.
20. M Groner. “Characterization of heparin antagonist virus-like particles by bio-layer interferometry.” **Oral** presentation, 247th ACS National Meeting, Dallas TX, Mar 2014.
21. G Mead. “Click chemistry and viruses: creating a better anticoagulant.” **Oral** presentation, Southern California Conference of Undergraduate Research. Whittier College, Nov 2013.
22. M Groner. “The virus BLItz: characterizing heparin antagonist virus-like particles.” **Oral** presentation, Southern California Conference of Undergraduate Research, Whittier College, Nov 2013.
23. G Mead. “Click chemistry and viruses: creating a better anticoagulant.” **Oral** presentation, Occidental College Summer Research Conference, Aug 2013.
24. G Mead. “Making a virus-based anticoagulant: using genetic manipulation, click chemistry and unnatural amino acids.” **Oral** presentation, Southern California Conference of Undergraduate Research. California State University, Channel Islands, Nov 2012.
25. G Mead. “Linker synthesis and sulfation of polyvalent bacteriophage Qβ.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2012.
26. HY Cheong. “Interaction between heparin and a virus like nanoparticle antagonist.” **Poster** presentation, Southern California Conference of Undergraduate Research, 2011.
27. D Drugan. “Mimicking heparin with polyvalent display of sulfated ligands on bacteriophage Qβ.” **Poster** presentation, Occidental College Summer Research Conference, Aug 2009.

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