

Charlie Fehl, PhD

Chemical biology tools for glycoprotein ID
Machine-learning actionable target pathways
Glycopeptidomimetic pharmacological probes

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October 2014 – September 2014 Postdoctoral research associate University of Oxford; Oxford; UK
September 2014 PhD in medicinal chemistry University of Kansas; Lawrence; USA
May 2009 BS in biochemistry University of Michigan; Ann Arbor; USA

Research

Wayne State University Chemistry (Detroit, MI, USA)
Assistant Professor

Aug 2018-present Characterizing epigenetic signaling pathways of protein glycosylation.

University of Oxford Chemistry (United Kingdom)
Postdoctoral mentor: Benjamin G. Davis, FRS

Oct. 2014-2018 • *High-throughput mass spectrometry and bioinformatic methodology to functionally characterize, annotate, and predict a glycosyltransferase superfamily involved in hormone signaling regulation*
Funded by a UK Catalysis Hub grant (UK EPSRC), Oct. 2014-Nov. 2018

Jan. 2016-2018 • *Visible light photoredox-catalyzed protein chemical ligation methods to install pure synthetic post-translational modifications on histone proteins*

University of Kansas Medicinal Chemistry (USA)
Graduate mentors: Jeffrey Aubé & Emily E. Scott

2011-2014 • *Target-based, rational design of cytochrome P450 17A1 (CYP17A1) inhibitors selective over CYP21A2 as biochemical probes for oncology: synthesis, assay development, structural biology, medicinal chemistry*
Funded by an ACS Medicinal Chemistry Pre-doctoral Fellowship

2010-2011 • *Overcoming product inhibition to yield a catalytic Schmidt reaction – efficient and green access to amide and lactam bonds*

2009 • *Development of conditions for a tandem Prins/Friedel–Crafts reaction*

Universität Regensburg Chemistry (Germany)
Mentor: Burkhard König

Summer 2012 • *Visible-light control of reactivity encoded onto carbohydrate surfaces – organic photochemistry on cellulose sheets for biological applications*
Funded by a NIH Training Grant in Dynamic Aspects of Chemical Biology

University of Michigan Biological Chemistry (USA)
Undergraduate mentor: Bruce Palfey

2007-2009 • *Biochemical mechanism of Campylobacter jejuni Thymidylate Synthase Complementing Protein (ThyX) via steady-state and transient kinetics*
Mentor: Ruthann Nichols

2006-2007 • *Pharmacology of CNS-active drosulfakinin peptides on Drosophila melanogaster gut and cardiovascular physiology (animal studies)*

Publications and Patents

High-throughput mass spectrometry and algorithmic modelling of glycobiochemistry data:

“Functional screening and chemo-bioinformatic analysis allows rationalization and activity prediction within a broad protein family.” Min Yang*, Charlie Fehl* [*equal], Karen V. Lees, Eng-Kiat Lim, Wendy Offen, Gideon J. Davies, Dianna J. Bowles, Stephen J. Roberts, and Benjamin G. Davis.

Nature Chemical Biology, revisions submitted (2018).

Medicinal chemistry toward improved breast and prostate cancer therapeutics:

“Structure-based design of inhibitors with improved selectivity for steroidogenic cytochrome P450 17A1 over cytochrome P450 21A2.” Fehl, Charlie; Vogt, Caleb; Yadav, Rahul; Li, Kelin; Scott, Emily E.; Aubé, Jeffrey. *J. Med. Chem.* Accepted. (2018)

“Inhibitors of CYP17A1” United States Patent 9,611,270 (April 4, 2017).

Charlie Fehl, Emily E. Scott, and Jeffrey Aubé.

Review on protein design for new activities:

“Proteins as templates for complex synthetic metalloclusters – progress toward bio-inspired heterometallic systems.” Charlie Fehl and Benjamin G. Davis.

Proceedings of the Royal Society A, 2016, 472, 20160078.

Review on biocatalysis for new chemical reactions:

“Outperforming Nature’s Catalysts: Designing Metalloenzymes for Chemical Synthesis.”

Charlie Fehl, Amanda G. Jarvis, Maria Palm-Espling, Benjamin G. Davis, and Paul C.J. Kamer. In *Modern Developments in Catalysis*; World Scientific Press: Singapore, 2016; 89-122.

Synthetic methodology for rethinking amide bond synthesis:

“Temperature Dependence of Turnover in a Sc(OTf)₃-Catalyzed Intramolecular Schmidt Reaction.” (invited publication in memory of Harry Wasserman)

Charlie Fehl, Erin Hirt, Sze-Wan Li, and Jeffrey Aubé. *Tetrahedron Letters*, 2015, 56, 3137.

“Overcoming Product Inhibition in Catalysis of the Intramolecular Schmidt Reaction.”

Hashim Motiwala, Charlie Fehl, Sze-Wan Li, Erin Hirt, Patrick Porubsky, and Jeffrey Aubé. *Journal of the American Chemical Society*, 2013, 135, 9000.

Development of light-controlled surfaces for analytical and biological templates:

“Photocatalytic Surface Patterning of Cellulose using Diazonium Salts and Visible Light.”

Peter Schroll, Charlie Fehl, Stephan Dankesreiter, and Burkhard König.

Organic & Biomolecular Chemistry, 2013, 11, 6510.

Review on carbon rearrangement chemistry:

“Hofmann, Curtius, Schmidt, Lossen and Related Reactions.” (Book Chapter)

Charlie Fehl, Ruzhang Liu, Michael McCleod, Hashim Motiwala, and Jeffrey Aubé.

In *Comprehensive Organic Synthesis*, 2nd Ed; Elsevier Limited: Amsterdam, 2014; pp. 598-635.

Construction of a complex anticancer natural product through new chemistry:

“Use of a Tandem Prins/Friedel–Crafts Reaction in the Construction of the Indeno-

Tetrahydropyridine Core of the Haouamine Alkaloids: Formal Synthesis of (–)-Haouamine A.”

Erik Fenster, Charlie Fehl, and Jeffrey Aubé. *Organic Letters*, 2011, 13, 2614-2617.

Teaching

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| 2017-2018 | Organic Chemistry (Oxford Chemistry; Part 1 (undergrad) final year) |
| 2015-2018 | Biological Chemistry (Oxford Biochemistry; First Year Undergraduates) |
| 2015-2017 | Developed two graduate units for the Synthesis for Biology & Medicine program at Oxford: “Synthetic Biology” and “Carbohydrate Chemistry” |
| 2014-2018 | Mentored six DPhil students and one MSci student at Oxford |
| 2010-2014 | Mentored three PhD students and one BSc student at KU |
| Fall 2010 | Graduate teaching assistant – MDCM 602: Medicinal Biochemistry (KU) |

Invited Conference Presentations

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| September 2017 | <ul style="list-style-type: none">• Oxford Chemical Biology Departmental Seminar (Oxford, UK) <i>Talk: “Functional Screening and Chemical-Bioinformatics Enables Family-Wide Prediction of Sugar Biocatalysis Networks”</i> |
| April 2017 | <ul style="list-style-type: none">• American Chemical Society National Meeting (San Francisco, CA) <i>Talk: “Structural insight from activity: Functional screening of the entire <i>Arabidopsis</i> GT1 family enables cheminformatic-bioinformatic predictions of glycosyltransferase reactions and protein features”</i> |
| July 2015 | <ul style="list-style-type: none">• UK Catalysis Hub Summer Conference (Harwell, UK) <i>Talk: “Structural Studies on Glycosyltransferases as Advanced Catalysts and Disease Targets”</i> |
| August 2014 | <ul style="list-style-type: none">• Medicinal Chemistry Gordon Research Conference (New London, NH) <i>Poster: “Design and Profile of Chemical Probes for Steroid Biosynthesis”</i> |
| September 2013 | <ul style="list-style-type: none">• American Chemical Society National Meeting (Indianapolis, IN) <i>Talk: “Structure-based Design of Novel Inhibitors for Sex Steroid Biosynthesis Targeting Metastatic Prostate Cancer”</i> |
| August 2013 | <ul style="list-style-type: none">• Medicinal Chemistry Gordon Research Conference (New London, NH) <i>Poster: “Structure-based Design of Novel Inhibitors for Sex Steroid Biosynthesis Targeting CYP17”</i> |
| June 2013 | <ul style="list-style-type: none">• Chemistry-Biology Interface Career Development Conference (Urbana-Champaign, IL) <i>“TED-like” talk: “Targeting Prostate & Breast Cancers – Safely and Selectively – at their Source”</i> |
| April 2013 | <ul style="list-style-type: none">• MIKI Graduate Research Symposium (Minneapolis, MN) <i>Talk: “Structure-based Design of Novel Inhibitors for Sex Steroid Biosynthesis”</i> |
| February 2013 | <ul style="list-style-type: none">• Capitol Research Summit (Topeka, KS) – <i>presented to state legislators</i> <i>Poster: “Targeting Sex Hormone Production at the Source – Next-Generation Therapeutics for Prostate and Breast Cancers”</i> |

Awards & Fellowships

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| July 2016 | Competitive 2-year renewal of UK Catalysis Hub grant (present funding) |
| November 2013 | 1 st Place poster award – KU Cancer Center Symposium (\$1000 award) |
| November 2012 | Les & Betty Mitscher Prize for Excellence in Medicinal Chemistry (KU) |

September 2012 ACS Div. of Medicinal Chemistry predoctoral fellow (1 of 4, in 2012)
April 2012 Poster competition winner – MIKI Graduate Research Symposium
August 2011 NIH Training Grant in Dynamic Aspects of Chemical Biology
May 2009 Merck Index Award (Undergraduate Research Award)

Outreach:

Aug 2015–Aug 2017 Member, American Association of Pharmaceutical Sciences Blog
Committee [steered blog readership and policy]

- Emphasized outreach, scientific ethics, ‘popular glycobiology,’ important developments (please see <http://aapsblog.aaps.org/2015/04/22/science-and-power-to-the-people/>)
- Facilitated several Oxford student posts on entrepreneurship, gender issues in science