

Christopher R. Graves, Ph.D.

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Academic Appointments

Associate Professor, Department of Chemistry & Biochemistry and Environmental Studies, Swarthmore College 2016–present

Associate Professor, Department of Chemistry & Biochemistry, Albright College 2015–2016

Assistant Professor, Department Chemistry & Biochemistry, Albright College 2011–2015

Lecturer, Department of Chemistry, University of Pennsylvania 2009–2011

Education & Training

Postdoctoral Research Fellow 2006–2009

Materials Physics and Applications (MPA-10), Los Alamos National Laboratory

Research Focus: Synthesis, Reactivity, Electronic Structure and Bonding of Pentavalent Organouranium Complexes

Advisor: Dr. Jaqueline L. Kiplinger

Ph.D. 2001–2006

Department of Chemistry, Northwestern University

Thesis Title: Environmentally Friendly Organic Methodologies: Asymmetric Organic Transformations via the Meerwein-Schmidt-Ponndorf-Verley-Oppenauer (MSPVO) Reaction Manifold

Advisor: Prof. SonBinh T. Nguyen

B.Sc. 1997–2001

Mount Allison University, First Class Honors with Distinction

Thesis Title: Synthesis and Reactivity of Palladium and Platinum Diimine Complexes Containing Boronate Esters

Advisor: Prof. Stephen A. Westcott

Thesis Title: The Kinetics and Mechanism of the Oxidation of the Thiol 3-Mercapto-1-propane Sulfonic Acid

Advisor: Prof. John F. Read

Current Research Focus

My current research activities are devoted to the development of novel Group 13 metal complexes for application as catalysts. We have a specific interest in the synthesis of metal complexes of redox-active ligands across various oxidation states and with novel reaction chemistries. The catalytic application of the complexes we prepare are guided by an understanding of the electronic structure and fundamental reactivity patterns of the compounds, as well as theory.

Fields of Training & Expertise

Organometallic chemistry • Coordination chemistry • Main group elements • Actinide elements • Molecular organic chemistry • Homogeneous catalysis • Redox-active & non-innocent ligands • Green chemistry

Awards & Honors

- Henry Dreyfus Teacher-Scholar Award, 2019–2024
- Cottrell Scholar (*Class of 2015*)
- ACS Division of Inorganic Chemistry Award for Undergraduate Research (with Bren Cole), 2015
- Research Corporation Cottrell College Science Award, 2015–2018
- Class of 1949 Annadora Vesper Shirk Award for Outstanding Faculty Scholarship, 2013
- NNSA Pollution Prevention Award, Best In Class, 2010
- Postdoctoral Publication Prize in Experimental Sciences, Los Alamos National Laboratory, 2009
- Postdoctoral Distinguished Performance Award, Los Alamos National Laboratory, 2008
- Glenn T. Seaborg Postdoctoral Fellowship, Los Alamos National Laboratory, 2008–2009
- Pollution Prevention Award, Los Alamos National Laboratory, 2008
- Award for “Outstanding Accomplishment and Dedication”, Los Alamos Award Program, Los Alamos National Laboratory, 2008
- Director’s Postdoctoral Fellowship, Los Alamos National Laboratory, 2006–2008
- Award for Excellence in Graduate Research (Chemistry Department), Northwestern University, 2006
- Edmund W. Gelewitz Award for “Outstanding Senior Graduate Student”, Northwestern University, 2005
- Natural Sciences and Engineering Research Council of Canada (NSERC) International Graduate Fellowship (PGS-D2), 2004–2006
- NSERC International Graduate Fellowship (PGS-A), 2002–2004
- Murray Sears Award for Excellence in Chemistry Laboratory Instruction, Mount Allison University, 2001
- NSERC Undergraduate Fellowship, Mount Allison University, 2000
- Goodridge Undergraduate Fellowship, Mount Allison University, 1999
- Nathaniel Morgan Award for Outstanding Student in Chemistry and Mathematics, Mount Allison University, 1999
- Mount Allison University Entrance Scholarship, 1997–2001
- A. G. Archibald Scholarship, 1997–2001

Professional Affiliations

- American Chemical Society
- Philadelphia Organic Chemistry Club
- Phi Lambda Upsilon, Alpha Gamma Chapter

Service to the Profession

Ad Hock Journal Article Peer Reviewer for: Inorganic Chemistry, Chemical Communications, New Journal of Chemistry, Advanced Synthesis and Catalysis, Journal of Catalysis, Tetrahedron Letters, Dalton Transactions, Australian Journal of Chemistry, Polyhedron

Funding Proposal Peer Reviewer for: Department of Energy, American Chemical Society-Petroleum Research Fund, National Science Foundation

Current Funding

Henry Dreyfus Teacher-Scholar Award: Enabling New Catalytic Chemistry for Aluminum with Non-Innocent and Redox-Active Ligands. \$75,000, 2019–2024, PI (Award #TH-19-021).

National Science Foundation: RUI-SusChEM: Redox-Active Aluminum Nitroxide Complexes for the anti-Markovnikov Hydrofunctionalization of Alkenes. \$174,000, 2017–2020, PI (Award #CHE-1664902).

Pending Funding

National Science Foundation: RUI: Enabling New Catalytic Chemistry for Aluminum, Gallium, and Indium via Ligand-Based Reactivity. \$225,141.

Previous Funding

Cottrell Scholar Collaborative Teacher Scholar Ambassador for PUI-R1 Partnerships (Phase II): \$3000, 2018–2019, Co-PI with Suzanne Bart (Purdue University).

Research Corporation Cottrell College Science Award: Aluminum-Nitroxide Complexes: New Redox-Active Aluminum Complexes for Applications in C-H Activation. \$40,000, 2015–2018 PI (Award #23329).

Cottrell Scholar Collaborative Teacher Scholar Ambassador for PUI-R1 Partnerships (Phase I): \$1000, 2017–2018. Co-PI with Suzanne Bart (Purdue University).

Undergraduate New Investigator American Chemical Society Petroleum Research Fund: Redox-Active Aluminum Complexes for Application in Carbonyl Reduction. \$50,000, 2012–2014, PI (Award #52181-UNI3).

Internal Funding

- Faculty Research Support Award, Swarthmore College \$3500 (2018–2020)
- Mellon Tri-Co Faculty Forum Brainstorming Grant \$600 (2017)
- Faculty Research Support Award, Swarthmore College \$3400 (2016–2018)

Student Research Collaborations (Swarthmore College)

- Omar Saleh '22 **2019–present** *Reactivity of Aluminum Nitroxide Complexes*
Funding: NSE Summer Research Fellowship (2019)
Related Student Presentations: Swarthmore Sigma Xi Poster Session (2019, *Poster*)
- Mika Maenaga '21 **2019–present** *Catalytic Activity of Aluminum Complexes of Nitroxide-Based Ligands*
Funding: Eugene M. Lang Summer Research Fellowship (2019)
- Judah Raab '21 **2018–present** *Reduced-Ligand α -Diimine Complexes of Aluminum*
Funding: Eugene M. Lang Summer Research Fellowship (2018), Tarble Summer Research Fellowship (2019).
Related Student Presentations: Swarthmore Sigma Xi Poster Session (2018, *Poster*)
- Lucas Heinzerling '20 **2018–present** *Tp-Aluminum Scaffolds Supporting Novel Functional Groups*
Funding: Mayer Davidson '57 Summer Research Fellowship (2018), Adamson Summer Research Fellowship (2019)
Related Student Presentations: Swarthmore Sigma Xi Poster Session (2018 & 2019, *Poster*)
- Alexa Clark '19 **2018–2019** *Group 13 Complexes of Bis-Nitroxide Ligands*
Funding: Hannay Chemistry Fund (2018)
Related Student Presentations: Swarthmore Sigma Xi Poster Session (2018, *Poster*)
After Swarthmore: Intern, Genentech
- Mackinsey Smith '19 **2017–2019** *Aluminum Complexes of Tripodal Nitroxide Ligands*
Funding: Frances Velay Womens Science Research Fellowship (2017), Swarthmore College Summer Research Fellowship (2018)
Related Student Presentations: Swarthmore Sigma Xi Poster Session (2017 & 2018, *Poster*), ACS Mid-Atlantic Regional Meeting (2017, *Poster*), Philadelphia Area Inorganic Colloquium (2017 & 2018, *Poster*), 83rd Annual Intercollegiate Students Chemists Convention (2019, *Oral Presentation, 1st Place*)
After Swarthmore: Graduate student, University of Wisconsin-Madison
Major Awards: 2018 Goldwater Fellowship, Selected for the 2018 Inorganic Chemistry Undergraduate Workshop

- Audra Woodside '19 **2017–2019** *Aluminum, Gallium, and Indium Complexes of a Tripodal Nitroxide Ligand*
Funding: James H. Scheuer Summer Internship in Environmental Studies (2017)
Related Student Presentations: Swarthmore Sigma Xi Poster Session (2017 & 2018, Poster), ACS Mid-Atlantic Regional Meeting (2017, Poster), Philadelphia Area Inorganic Colloquium (2017 & 2018, Poster), 83rd Annual Intercollegiate Students Chemists Convention (2019, Oral Presentation).
After Swarthmore: Graduate student, Brown University
Major Awards: ACS Division of Inorganic Chemistry Student Travel Award
- Rares Mosneanu '18 **2017–2018** *Heterobimetallic Aluminum-Alkali Metal Complexes of Tetraanionic Chiral Ligands*
Funding: Swarthmore College Summer Research Fellowship (2017)
Related Student Presentations: Swarthmore Sigma Xi Poster Session (2017, Poster).
After Swarthmore: Research Assistant, Columbia University
- Henry Wilson '18 **2017–2018** *Synthesis of Electronically Diverse Neutral-Ligand Al- α -Diimine Complexes*
Funding: Peter and Aleck Karis Fellowship in Environmental Studies (2017)
Related Student Presentations: Swarthmore Sigma Xi Poster Session (2017, Poster), ACS Mid-Atlantic Regional Meeting (2017, Poster), 82nd Annual Intercollegiate Students Chemists Convention (2018, Oral Presentation, 2nd Place)
After Swarthmore: Graduate student, University of Pennsylvania
- Zain Hannan '17 **2017** *Synthesis of Electronically Diverse Neutral-Ligand Al- α -Diimine Complexes*
After Swarthmore: Research Assistant, University of Pennsylvania
- Jacob Kirsch '17 **2016–2017** *Structure and Reactivity of Pyridyl-Nitroxide Complexes of Group 13 Metals*
After Swarthmore: Graduate student, Stanford University
Major Awards: NSF Graduate Research Fellowship (Honorable Mention)

Student Research Collaborations (Albright College)

- Caroline Endy '17 **2015–2016** *Theoretical Investigation of Aluminum Complexes of Redox-active Ligands*
After Albright: Polymer Chemist, DOW Chemical
- Ken Richardson '17 **2015** *Aluminum Complexes of Tripodal Nitroxide Ligands*
After Albright: Sale Representative, Pfizer Pharmaceuticals
- Thomas Herb '16 **2015–2016** *Aluminum Complexes of Tripodal Nitroxide Ligands*
Related Student Presentations: Disappearing Boundaries Summer Research Meeting (2015, Poster), National Conference on Undergraduate Research (2016, Poster), Lehigh Valley American Chemical Society Undergraduate Poster Session (2016, Poster).
After Albright: Medical Student, Penn State Hershey College of Medicine
Major Awards: ACS Division of Inorganic Chemistry Student Travel Award
- Patrick Wise '16 **2014–2016** *Synthesis of Singly-Reduced Al- α -Diimine Complexes*
Funding: 2014 Summer ACRE
Related Student Presentations: Disappearing Boundaries Summer Research Meeting (2015, Poster), National Conference on Undergraduate Research (2016, Poster), Lehigh Valley American Chemical Society Undergraduate Poster Session (2016, Poster).
After Albright: Medical Student, Penn State Hershey College of Medicine

- Connor Koellner '15 **2013–2015** *Synthesis and Characterization of Aluminum Complexes with Neutral Diimine Ligands*
Related Student Presentations: Lehigh Valley American Chemical Society Undergraduate Poster Session (2014, Poster), 78th Annual Intercollegiate Students Chemists Convention (2014, Oral Presentation), 5th Mid-Atlantic Seaboard Inorganic Symposium (2014, Poster), Higher Education Council of Berks County 16th Annual Conference for Undergraduate Research & Creative Expression (2015, Poster).
After Albright: Graduate Student, Department of Chemistry, Temple University
- Andrew Poitras '15 **2013–2015** *Synthesis of Aluminum Nitroxide Complexes: Progress Toward Redox-Active Aluminum Systems*
After Albright: Graduate Student, Department of Chemistry, Brandeis University
- Kevin Yeagle '15 **2012–2015** *Synthesis and Catalytic Activity of Aluminum Amidate Complexes*
Funding: 2013 Summer ACRE, 2014 Summer ACRE
Related Student Presentations: Mid-Atlantic Seaboard Inorganic Symposium (2014, Poster), Higher Education Council of Berks County 16th Annual Conference for Undergraduate Research & Creative Expression (2015, Poster).
After Albright: Medical Student, Penn State Hershey College of Medicine
- Jessica McClure '14 **2014** *Synthesis of Chiral Bis-Amidate Ligands*
After Albright: Quality Control Chemist, Sovereign Pharmaceuticals
- Bren (Zeke) Cole '14 **2011–2014** *Synthesis of a Series of Aluminum Diimine Complexes: Progress Toward Redox-Active Aluminum Systems*
Funding: 2012 Interim ACRE, 2012 Summer ACRE, 2013 Interim ACRE
Related Student Presentations: Higher Education Council of Berks County 13th Annual Conference for Undergraduate Research & Creative Expression (2012, Poster), Lehigh Valley American Chemical Society Undergraduate Poster Session (2012, Poster), Disappearing Boundaries Summer Research Meeting (2012, Poster), Higher Education Council of Berks County 14th Annual Conference for Undergraduate Research & Creative Expression (2013, Oral Presentation), Lehigh Valley American Chemical Society Undergraduate Poster Session (2013, Poster), 77th Annual Intercollegiate Students Chemists Convention (2013, Oral Presentation), Lehigh Valley American Chemical Society Undergraduate Poster Session (2014, Poster), 78th Annual Intercollegiate Students Chemists Convention (2014, Oral Presentation), National Conference on Undergraduate Research (2014, Oral presentation), Undergraduate Research Day at the Capitol (2014, Poster)
After Albright: Graduate Student, Department of Chemistry, University of Pennsylvania
Major Awards: 2013 Goldwater Fellowship, NSF Graduate Research Fellowship, ACS Division of Inorganic Chemistry Student Travel Award
- Darryl Hester '13 **2011–2012** *Synthesis of a Series of Aluminum Amidate Complexes: Progress Toward Novel Aluminum Lewis-Acid Catalysts*
Funding: 2012 Interim ACRE, 2012 Summer ACRE
Related Student Presentations: Higher Education Council of Berks County 13th Annual Conference for Undergraduate Research & Creative Expression (2012, Poster), Lehigh Valley American Chemical Society Undergraduate Poster Session (2012, Poster), Disappearing Boundaries Summer Research Meeting (2012, Poster)
After Albright: Process Development Scientist, Novasep

Teaching Experience

Swarthmore College

- Chemistry 015 – Environmental Chemistry (Lecture & Lab)
- Chemistry 056 – Inorganic Chemistry (Lecture)
- Chemistry 022 – Organic Chemistry I (Lab)
- Chemistry 010 – General Chemistry (Lab)
- Environmental Studies 001 – Introduction to Environmental Studies (Lecture)
- Environmental Studies 092 – UNFCC COP (Travel course)

Albright College

- Chemistry 105/106 – General Analytical Chemistry I/II (Lecture & Lab)
- Chemistry 207 – Organic Chemistry I (Lab)
- Chemistry 208 – Organic Chemistry II (Lab)
- Chemistry 324 – Inorganic Chemistry (Lecture & Lab)
- Chemistry 412 – Advanced Topics: Organometallic Chemistry (Lecture)
- Chemistry 412 – Environmental Chemistry (Lab)

University of Pennsylvania

- Chemistry 241/241 – Organic Chemistry I/II
- Chemistry 245 – Experimental Organic Chemistry I
- Chemistry 246 – Experimental Organic Chemistry II

Northwestern University

- Chemistry 413-02 – Metals in Organic Synthesis
- Chemistry 418 – Organometallic Chemistry
- Chemistry 412 – Organic Reaction Mechanisms (Teaching Assistant)
- Chemistry 212 – Organic Chemistry (Teaching Assistant)
- Chemistry 101 – General Chemistry (Teaching Assistant)

Mount Allison University

- Organic Chemistry Lab Assistant
- Inorganic Chemistry Lab Assistant (Main Group, Transition Metals, and Organometallics)
- Calculus Lab Assistant

Publications

From work during independent career (undergraduate co-authors underlined):

- 34) Woodside, A.J.; Smith, M.A.; Herb, T.M.; Manor, B.C.; Carroll, P.J. Rablen, P.R.; Graves, C.R. “Synthesis and characterization of a tripodal tris(nitroxide) aluminum complex and its catalytic activity toward carbonyl hydroboration” *Organometallics* **2019**, *38*, 1017–1020.
- 33) Kirsh, J. M.; Woodside, A. J.; Manor, B. C.; Carroll, P. J.; Rablen, P. R.; **Graves, C. R.** “Synthesis and characterization of (pyNO⁻)₂GaCl: A redox-active gallium complex” *Inorganics* **2018**, *6*, 50. (Invited contribution to the Special Issue on Redox-Active Ligand in Coordination Chemistry, Open Access)
- 32) Wilson, H. H.; Koellner, C. A.; Hannan, Z. M.; Endy, C. B.; Bezpalko, M. W.; Piro, N. A.; Kassel, W. S.; Sonntag, M. D.; **Graves, C. R.** “Synthesis and characterization of neutral ligand α -diimine complexes of aluminum with tunable redox energetics” *Inorg. Chem.* **2018**, *57*, 9622–9633. (Invited contribution to the Forum on Applications of Metal Complexes with Ligand-Centered Radicals)
- 31) Herb, T. M.; Poitras, A. M.; Richardson, K. G.; Cole, B. E.; Bogart, J. A.; B. E.; Carroll, P. J.; Schelter, E. J.; **Graves, C. R.** “Synthesis and characterization of aluminum nitroxide complexes” *Polyhedron* **2016**, *114*, 194–199.
- 30) Poitras, A. M.; Bogart, J. A.; Cole, B. E.; Carroll, P. J.; Schelter, E. J.; **Graves, C. R.** “Synthesis and characterization of redox-active aluminum-pyridyl nitroxide complexes” *Inorg. Chem.* **2015**, *54* 10901–10908.
- 29) Koellner, C. A.; Piro, N. A.; Kassel, W. S.; Goldsmith, C. R.; **Graves, C. R.** “Synthesis and characterization of α -diimine complexes of group 13 metals and their catalytic activity toward the epoxidation of alkenes” *Inorg. Chem.* **2015**, *54*, 7239–7141.
- 28) Yeagle, K. P.; Hester, D.; Piro, N. A.; Dougherty, W. G.; Kassel, W. S.; **Graves, C. R.** “Synthesis, characterization, and catalytic activity of a series of aluminum-amidate complexes” *Aust. J. Chem.* **2015**, *68*, 357–365.
- 27) Cole, B. E.; Wolbach, J. P.; Dougherty, W. G.; Piro, N. A.; Kassel, W. S.; **Graves, C. R.** “Synthesis and characterization of aluminum- α -diimine complexes over multiple redox states” *Inorg. Chem.* **2014**, *53*, 3899–3906.

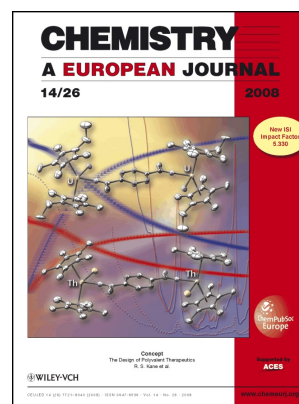
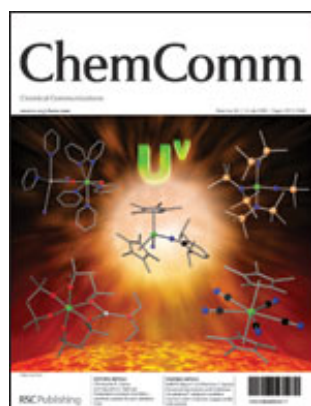
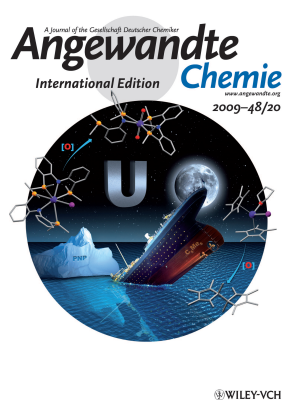
From previous work:

- 26) Thomson, R. K.; **Graves, C. R.**; Scott, B. L.; Kiplinger, J. L. “Straightforward and efficient oxidation of tris(aryloxy) and tris(amide) uranium(III) complexes using copper(I) halide reagents” *Inorg. Chem. Commun.* **2011**, *14*, 1742–1744.
- 25) Thomson, R. K.; **Graves, C. R.**; Scott, B. L.; Kiplinger, J. L. “Synthesis and molecular structure of (C₅Me₅)₂U(O-^tBu)(SePh): A mixed-ligand selenide-alkoxide uranium(IV) metallocene complex resulting from *tert*-butoxy-trimethylsilane elimination” *J. Chem. Cryst.* **2011**, *41*, 1241–1244.
- 24) Thomson, R. K.; **Graves, C. R.**; Scott, B. L.; Kiplinger, J. L. “Uncovering alternate reaction pathways to access uranium(IV) mixed-ligand aryloxy-chloride and alkoxide-chloride metallocene complexes: Synthesis and molecular structures of (C₅Me₅)₂U(O-2,6-ⁱPr₂C₆H₃)(Cl) and (C₅Me₅)₂U(O-^tBu)(Cl)” *Inorg. Chim. Acta.* **2011**, *369*, 270–273.
- 23) Thomson, R. K.; **Graves, C. R.**; Scott, B. L.; Kiplinger, J. L. “Organometallic uranium(IV) fluoride complexes: Preparation using protonolysis chemistry and reactivity with trimethylsilyl reagents” *Dalton Trans.* **2010**, *39*, 6826–6831.
- 22) Schelter, E. J.; Wu, R.; Veauthier, J. M.; Bauer, E. D.; Booth, C. H.; Thomson, R. K.; **Graves, C. R.**; John, K. D.; Scott, B. L.; Thompson, J. D.; Morris, D. E.; Kiplinger, J. L. “Comparative study of f-element electronic structure across a series of multimetallic actinide, lanthanide-actinide, and lanthanum-actinide complexes possessing redox-active bridging ligands” *Inorg. Chem.* **2010**, *49*, 1995–2007.

- 21) **Graves, C. R.;** Kiplinger, J. L. “Pentavalent uranium organometallic chemistry – Synthetic pursuit of a rare oxidation state” *Chem. Commun.* **2009**, 3831–3853 (*Invited Feature Article, Editor’s Choice for Cover Art*).
- 20) Thomson, R. K.; **Graves, C. R.;** Scott, B. L.; Kiplinger, J. L. “Noble reactions for the actinides: Safe gold-based access to organouranium and azide Complexes” *Eur. J. Inorg. Chem.* **2009**, 1451–1455 (*Editor’s Choice for Cover Art*).
- 19) Cantat, T.; **Graves, C. R.;** Scott, B. L.; Kiplinger, J. L. “Challenging the metallocene dominance in actinide chemistry with a soft PNP pincer ligand: New uranium structures and reactivity patterns” *Angew. Chem., Int. Ed.* **2009**, *48*, 3681–3684 (*Editor’s Choice for Cover Art, Research Highlight in Nature Chemistry*).
- 18) **Graves, C. R.;** Scott, B. L.; Morris, D. E.; Kiplinger, J. L. “Selenate and tellurate complexes of pentavalent uranium” *Chem. Commun.* **2009**, 776–778.
- 17) **Graves, C. R.;** Vaughn, A. E.; Schelter, E. J.; Scott, B. L.; Thompson, J. D.; Morris, D. E.; Kiplinger, J. L. “Probing the electronic structure and redox energetics in pentavalent organoactinide complexes” *Inorg. Chem.* **2008**, *47*, 11879–11891.
- 16) Cantat, T.; **Graves, C. R.;** Jantunen, K. C.; Burns, C. J.; Scott, B. L.; Hay, P. J.; Morris, D. E.; Kiplinger, J. L. “Evidence for the involvement of 5f-orbitals in the bonding and reactivity of organometallic actinide compounds: Thorium(IV) and uranium(IV) bis(hydrazonato) complexes” *J. Am. Chem. Soc.* **2008**, *130*, 17537–17551.
- 15) **Graves, C. R.;** Schelter, E. J.; Cantat, T.; Scott, B. L.; Kiplinger, J. L. “A Mild Protocol to Generate Uranium(IV) Mixed-Ligand Metallocene Complexes Using Copper(I) Iodide” *Organometallics* **2008**, *27*, 5371–5378.
- 14) **Graves, C. R.;** Scott, B. L.; Morris, D. E.; Kiplinger, J. L. “Tetravalent and pentavalent uranium acetylide complexes prepared by oxidative functionalization with Cu-C≡C-Ph” *Organometallics* **2008**, *27*, 3335–3337.
- 13) Schelter, E. J.; Veauthier, J. M.; **Graves, C. R.;** John, K. D.; Scott, B. L.; Thompson, J. D.; Morris, D. E.; Kiplinger, J. L. “1,4-Dicyanobenzene as a scaffold for the preparation of multimetallic actinide complexes” *Chem. Eur. J.* **2008**, *14*, 7782–7790 (*Editor’s Choice for Cover Art*).
- 12) Pickett, Z. N.; Howard, W. A.; **Graves, C. R.;** “4-Chloro-2,6-bis(hydroxymethyl)pyridinium chloride and 4-dimethylamino-2,6-bis(hydroxymethyl)pyridinium chloride hemihydrate” *J. Chem. Crystallogr.* **2008**, *38*, 717–721.
- 11) **Graves, C. R.;** Yang, P.; Kozimor, S. A.; Vaughn, A. E.; Clark, D. L.; Conradson, S. D.; Schelter, E. J.; Scott, B. L.; Thompson, J. D.; Hay, P. J.; Morris, D. E.; Kiplinger, J. L. “Organometallic uranium(V)-imido halide complexes: From synthesis to electronic structure and bonding” *J. Am. Chem. Soc.* **2008**, *130*, 5272–5285 (*Chosen for the 2009 Postdoctoral Publication Prize in Experimental Sciences*).
- 10) **Graves, C. R.;** Morris, D. E.; Scott, B. L.; Kiplinger, J. L. “Facile access to pentavalent uranium organometallics: One electron oxidation of uranium(IV) imido complexes with copper(I) salts” *J. Am. Chem. Soc.* **2007**, *129*, 11914–11915.
- 9) **Graves, C. R.;** Zhou, H.; Stern, C. L.; Nguyen, S. T. “A mechanistic investigation of the asymmetric Meerwein-Schmidt-Ponndorf-Verley (MSPV) reduction catalyzed by BINOL/AlMe₃ – Structure, kinetics, and enantioselectivity” *J. Org. Chem.* **2007**, *72*, 9121–9133.
- 8) **Graves, C. R.;** Zeng, B. –S.; Nguyen, S. T. “Efficient and selective oxidation of alcohols via Al-based Oppenauer catalysis” *J. Am. Chem. Soc.* **2006**, *128*, 12596–12597.
- 7) **Graves, C. R.;** Scheidt, K. A.; Nguyen, S. T. “Enantioselective MSPV reduction of ketimines using 2-propanol and (BINOL)Al^{III}” *Org. Lett.* **2006**, *8*, 1229–1232.
- 6) **Graves, C. R.;** Campbell, E. J.; Nguyen, S. T. “Aluminum-based catalysts for the asymmetric Meerwein-Schmidt-Ponndorf-Verley-Oppenauer (MSPVO) reaction manifold” *Tetrahedron: Asymmetry* **2005**, *16*, 3460–3468 (*Review Article, Invited*).

- 5) Cohen, R.; **Graves, C. R.**; Nguyen, S. T.; Martin, J. M. L; Ratner, M. A. "The mechanism of aluminum-catalyzed Meerwein-Schmidt-Ponndorf-Verley (MSPV) reduction of carbonyls to alcohols" *J. Am. Chem. Soc.* **2004**, *126*, 14796–14803.
- 4) **Graves, C. R.**; Merlau, M. L.; Morris, G. A.; Sun, S. -S.; Nguyen, S. T.; Hupp, J. T. "Characterization and purification of supramolecular metal complexes using gel-permeation chromatography" *Inorg. Chem.* **2004**, *43*, 2013–2017.
- 3) Read, J. F.; **Graves, C. R.**; Jackson, E. "The kinetics and mechanism of the oxidation of the thiols 3-Mercapto-1-propane sulfonic acid and 2-mercaptopyridine-3-thiol by potassium ferrate" *Inorg. Chim. Acta* **2003**, *348*, 41–49.
- 2) King, A. S.; Nikolcheva, L. G.; **Graves, C. R.**; Kaminski, A.; Vogels, C. M.; Hudson, R. H. E.; Ireland, R. J.; Duffy, S. J.; Westcott, S. A. "Synthesis and reactivity of palladium and platinum diimine complexes containing boronate esters" *Can J. Chem.* **2002**, *80*, 1217–1222.
- 1) Read, J. R.; Bewick, S. A.; **Graves, C. R.**; MacPherson, J. M.; Salah, J. C.; Theriault, A.; Wyand, A. E. H. "The kinetics and mechanism of the oxidation of *S*-methyl-*L*-cysteine, *L*-cystine and *L*-cysteine by potassium ferrate" *Inorg. Chim. Acta.* **2000**, *303*, 244–255.

Covers in International Peer-Reviewed Journals



CSD Communications

- CCDC# 1967342 (DOI: 10.5517/ccdc.csd.cc2415n1)
- CCDC#1967341 (DOI: 10.5517/ccdc.csd.cc2415m0)
- CCDC#1967340 (DOI: 10.5517/ccdc.csd.cc2415lz)

Presentations

Invited departmental seminars

Barnard College (2018)
Haverford College (2017)
Colgate University (2017)
Purdue University (2017)
Villanova University (2017)
Swarthmore College (2016)

Contributed & invited talks from work during independent career (undergraduate co-authors underlined):

- **Graves, C. R.** "Group 13 metal complexes incorporating ligands with multiple nitroxide groups: Synthesis, characterization and reactivity studies" *ACS National Meeting*, Philadelphia, PA, March **2020**. (Oral, Invited)
- Saleh, O.; **Graves, C. R.** "Aluminum complexes of pyridylhydroxyl amines" *ACS National Meeting*, Philadelphia, PA, March **2020**. (Poster)

- Heinzerling, L. R.; **Graves, C. R.** “*tris*-Pyrazolylborate aluminum complexes supporting redox-active ligands” *ACS National Meeting*, Philadelphia, PA, March **2020**. (Poster)
- Raab, J. B.; **Graves, C. R.** “Aluminum α -diimine complexes across various oxidation states” *ACS National Meeting*, Philadelphia, PA, March **2020**. (Poster)
- Maenaga, M. L.; **Graves, C. R.** “Group 13 metal complexes of tripodal ligands incorporating nitroxide functional groups” *ACS National Meeting*, Philadelphia, PA, March **2020**. (Poster)
- **Graves, C. R.** “Enabling new catalytic chemistry for aluminum with non-innocent/redox-active ligands” *Philadelphia Area Inorganic Colloquium*, May 2019. (Invited Lecture)
- **Graves, C. R.** “Aluminum complexes of α -diimine ligands: Synthesis, characterization, and reaction chemistry of tailorable redox-active Al complexes” *Gordon Conference on Inorganic Reaction Mechanisms*, Galveston, March **2019**. (Poster)
- Heinzerling, L. R.; Raab, J. B.; **Graves, C. R.** “Aluminum complexes of nitrogen-based redox-active ligands” *ACS National Meeting*, Boston, MA, August **2018**. (Poster)
- Smith, M. A.; Woodside, A. J.; Clark, A. C.; **Graves, C. R.** “Group 13 complexes of nitroxide ligands: Novel redox-active complexes of Al, Ga, and In” *256th ACS National Meeting*, Boston, MA, August **2018**. (Poster)
- **Graves, C. R.** “Group 13 complexes of nitroxide-based redox-active ligands” *Gordon Conference on Organometallic Chemistry*, Salve Regina University, July **2018**. (Poster)
- **Graves, C. R.** “Aluminum complexes of redox-active ligands: Synthesis and characterization of Al- α -diimine complexes”, *254th ACS National Meeting*, Washington, D.C., August **2017**. (Oral)
- Woodside, A. J.; Smith, M. A.; **Graves, C. R.** “Aluminum complexes of nitroxide-based redox-active ligands” *254th ACS National Meeting*, Washington, D.C., August **2017**. (Poster)
- Mosneanu, R.; **Graves, C. R.** “Heterobimetallic aluminum-alkali metal complexes of tetraanionic chiral ligands” *254th ACS National Meeting*, Washington, D.C., August **2017**. (Poster)
- **Graves, C. R.** “Synthesis, characterization, and catalytic activity of aluminum- α -diimine complexes” *45th ACS Mid-Atlantic Regional Meeting*, Hershey, PA, June **2017**. (Oral, Invited)
- **Graves, C. R.** “Synthesis and characterization of aluminum complexes of nitroxide-based ligands: A new family of redox-active aluminum complexes” *ACS Mid-Atlantic Regional Meeting*, Hershey, PA, June **2017**. (Oral, Invited)
- Wilson, H. H.; Kirsh, J. M.; Smith, M. A.; Woodside, A. J.; Hannan, Z. M.; Endy, C. B.; Herb, T. M.; Wise, P. M.; Koellner, C. A.; **Graves, C. R.** “Aluminum complexes of redox-active ligands” *45th ACS Mid-Atlantic Regional Meeting*, Hershey, PA, June **2017**. (Poster)
- **Graves, C. R.** “Synthesis and characterization of aluminum complexes of redox-active nitroxide-based ligands”, *252nd ACS National Meeting*, Philadelphia, PA August **2016**. (Oral)
- Wise, P. M.; Herb, T. M.; **Graves, C. R.** “Aluminum complexes of redox-active ligands: Synthesis, characterization, and preliminary reaction studies” *251st ACS National Meeting*, San Diego, CA March **2016**. (Poster, Chosen for SciMix)
- **Graves, C. R.** “Synthesis, Characterization and catalytic activity of novel aluminum compounds” *The International Chemical Conference of Pacific Basin Societies*, Honolulu, HI December **2015**. (Oral)
- **Graves, C. R.** “Synthesis, characterization, and catalytic activity of novel aluminum compounds” *Lehigh Valley ACS Meeting*, Reading, PA February **2015**. (Invited Lecture)
- Yeagle, K. P.; Hester, D.; Wise, P. M.; Dougherty, W. G.; Piro, N. A.; Kassel, W. S.; **Graves, C. R.**; “Synthesis and catalytic activity of aluminum amidate complexes” *248th ACS National Meeting*, San Francisco, CA August **2014**. (Poster, Chosen for SciMix)
- Koellner, C. A.; Poitras, A. M.; Cole, B. E.; Bogart, J. A.; Dougherty, W. G.; Piro, N. A.; Carrol, P. J.; Kassel, W. S.; Schelter, E. J.; **Graves, C. R.** “Synthesis and characterization of aluminum complexes of redox-active ligands” *248th ACS National Meeting*, San Francisco, CA August **2014**. (Poster)
- **Graves, C. R.** “Redox-active aluminum systems” *Gordon Conference on Inorganic Chemistry*, University of New England, June **2014**. (Poster)
- Cole, B. E.; Koellner, C. A.; Dougherty, W. G.; Piro, N. A.; Kassel, W. S.; **Graves, C. R.**; “Aluminum- α -diimine complexes: Redox-active aluminum systems” *247th ACS National Meeting*, Dallas, TX March **2014**. (Poster)
- **Graves, C. R.** “Aluminum- α -diimine complexes: Redox-active aluminum systems” *20th EuCheMS Conference on Organometallic Chemistry*, St. Andrews, Scotland, July **2013**. (Poster, Chosen for a Poster Talk)

- Cole, B. E.; Dougherty, W. G.; Kassel, W. S.; **Graves, C. R.** “Synthesis of a series of aluminum α -diimine complexes: Progress toward redox-active aluminum complexes” *244th ACS National Meeting*, Philadelphia, PA, August **2012**. (*Poster*)
- Hester, D.; Dougherty, W. G.; Kassel, W. S.; **Graves, C. R.** “Synthesis of a series of aluminum amidate complexes and their catalytic activity” *244th ACS National Meeting*, Philadelphia, PA, August **2012**. (*Poster*)

General Audience Presentations

- **Graves, C. R.** “From scribbles to compounds and back again: A chemists tale” *2nd Tuesday Cafe*, Swarthmore College, April **2018**. ([Link to transcript/audio](#))

Outreach Presentations

- **Graves, C. R.** “I am a chemistry and this is what I do” *Out4STEM*, December **2019**.
- Vann, J.; **Graves, C. R.** “What is global warming?” *Penn Alexander Elementary School*, November **2019**.