Joseph P. Hooper

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Experience:

Full Professor June 2020 to current
Associate Professor of Physics June 2016 to June 2020
Assistant Professor of Physics June 2011 to June 2016
Naval Postgraduate School
Joint appointment in Mechanical and Aeronautical Engineering
Research areas:

- New incendiary materials that enhance Navy weapons via fast metal combustion. I develop new materials that can take advantage of the large energy density present in the aerobic combustion of fine metal powder.
- High strain-rate plasticity, fracture, and fragmentation of solids. I operate several ballistics and high-velocity impact labs to study material fracture under shock loading or impact, and use this data to develop analytic models.
- Energetic materials and novel fuels. I do computational and experimental research on new solid propellants and explosives, focusing on ways to integrate fast metal combustion.
- Large-scale simulations of materials at the atomistic level. I use density functional theory and quantum molecular dynamics to study mechanical and chemical response of materials at extremes of pressure and temperature.

Research Physicist May 2007 to June 2011
Naval Surface Warfare Center, Indian Head
Research areas: Theory and modeling of explosives and reactive materials.

Naval Research Lab/ASEE Fellow June 2006 to May 2007
Naval Surface Warfare Center, Indian Head
Advisor: Dr. Frank Zerilli
Research area: van der Waals-corrected density functional theory calculations of molecular crystal equations of state.

Education:

Tulane University 2002-2006
Doctor of Philosophy, Physics
Specialization: Condensed matter physics.
Dissertation: "Studies of the itinerant metamagnet $Sr_3Ru_2O_7$."

Georgia Institute of Technology 1998-2002
Bachelor of Science, Computer Science, *summa cum laude*
Research: Developed computational physics programs to help characterize optical scattering off of complex, amorphous surfaces.

Awards

Carl E. and Jessie W. Menneken Faculty Award for Excellence in Scientific Research, 2013. This is the top research award for faculty at the Naval Postgraduate School.

Navy 2010 Delores Etter Top Scientists and Engineers Award (as part of NSWC Indian Head's Reactive Materials Team) for work on development of new structural reactive materials.

2009 NSWC Indian Head Harold R. Stark Award for Innovation (as part of Reactive Materials Team) for work on fragmentation of reactive materials.

Publications:

S. Wang, J. Kline, B. Miles, and J. P. Hooper. "Reactive fragment materials made from an aluminum-silicon eutectic powder." *J. Appl. Phys.* 128, 065903 (2020).

J. Kline and J. P. Hooper. "The effect of annealing on the impact fragmentation of a pure aluminum reactive material." *J. Appl. Phys.* **125**, 205901 (2019). **Editor's Pick.**

S. Vaddypally, W. Tomlinson, O. O'Sullivan, R. Ding, M. Van Vliet, B. Wayland, J. P. Hooper, and M. Zdilla. "Activation of C-H, N-H, and O-H bonds via proton-coupled electron transfer to a Mn(III) complex of redox-noninnocent octaazacyclotetradecadiene, a catenated-nitrogen macrocyclic ligand." *J. Am. Chem. Soc.* **141**, 5699 (2019).

G. Zhao, C. He, D. Kumar, J. P. Hooper, G. Imler, D. Parrish, and J. M. Shreeve. "1,3,5-Triiodo-2,4,6-trinitrobenzene (TITNB) from Benzene: Balancing Excellent Performance and High Thermal Stability of Functional Energetic Materials." *Chem. Eng. J.* **368**, 244 (2019).

M. Tang and J. P. Hooper. "Impact fragmentation of a brittle metal compact." *J. Appl. Phys.* **123**, 175901 (2018).

W. W. Tomlinson, D. Morris, C. Johnson, and J. P. Hooper. "Topology and equilibrium analysis of the monovalent aluminum compound $Al_4Cp_4^{*Ph}$." *Z. Anorg. Allg. Chem.* **644**, 454 (2018).

X. Tang, J. DeLisio, S. Alnemrat, Z. Hicks, L. Stevens, C. Stoltz, J. P. Hooper, B. Eichhorn, M. Zachariah, K. Bowen, and D. Mayo. "Mechanistic studies of $[AlCp^*]_4$ Combustion." *Inorg. Chem.* **57**, 8181 (2018).

W. W. Tomlinson, D. H. Mayo, R. M. Wilson, and J. P. Hooper. "The role of ligand steric bulk in new monovalent aluminum compounds." *J. Phys. Chem. A* **121**, 4678 (2017).

C. He, G. Zhao, J. P. Hooper, and J. M. Shreeve. "Energy and biocides storage compounds: synthesis and characterization of energetic bridged bis(triiodoazoles)." *Inorg. Chem.* **56**, 13547 (2017).

G. Zhao, D. Kumar, C. He, J. P. Hooper, G. H. Imler, D. A. Parrish, and J. M. Shreeve. "New generation agent defeat weapons: energetic N,N'-ethylene-bridged polyiodoazoles." *Chem. Eur. J.* **23**, 16753 (2017).

S. Vaddypally, I. G. McKendry, W. Tomlinson, J. P. Hooper, M. J. Zdilla. "Electronic structure of manganese complexes of the redox-non-innocent tetrazene ligand evidence for the metal-azide/imido cycloaddition intermediate." *Chem. Eur. J.* **22**, 10548 (2016).

J. Hemmer, S. Poelma, N. Treat, Z. Page, N. Dolinski, Y. Diaz, W. Tomlinson, K. Clark, J. P. Hooper, C. Hawker, J. Read de Alaniz. "Tunable visible and near infrared photoswitches." *J. Am. Chem. Soc.* **138**, 13960 (2016).

C. He, J. P. Hooper, and J. M. Shreeve. "Iodine-rich imidazolium iodate and periodate salts: en route to single-based biocidal agents." *Inorg. Chem.* **55**, 12844 (2016).

D. Chand, C. He, J. P. Hooper, L. A. Mitchell, D. A. Parrish, and J. M. Shreeve.

"Mono- and diiodo-1,2,3-triazoles and their mono nitro derivatives." *Dalton Trans.* **45**, 9684 (2016).

M. J. Krayewsky and J. P. Hooper. "Fragmentation and high-rate compression of Navy reactive materials." JANNAF Journal of Propulsion and Energetics, 2016.

Y. M. Tan, O. Cervantes, S. Nam, J. D. Molitoris, and J. P. Hooper. "Dynamic fragmentation of cellular, ice-templated alumina scaffolds." *J. Appl. Phys.* **119**, 024901 (2016).

S. Alnemrat, D. H. Mayo, S. DeCarlo, and J. P. Hooper. "Growth of metalloid aluminum clusters on graphene vacancies." *J. Chem. Phys.*. **144**, 024703 (2016).

A. Ponce, L. B. Brostoff, S. K. Gibbons, P. Zavalij, C. Viragh, J. P. Hooper, S. Alnemrat, K. Gaskell, and B. Eichhorn. "Elucidation of the Fe(III) gallate structure in historical iron gall ink." *Anal. Chem.* **88**, 5152 (2016).

S. DeCarlo, D. Mayo, W. Tomlinson, J. Hu, J. P. Hooper, P. Zavalij, H. Schnoeckel, K. H. Bowen, and B. Eichhorn. "Synthesis, structure, and properties of Al(R-bpy)$_3$ complexes (R = t-Bu, Me): homoleptic main-group tris-bipyridyl compounds." *Inorg. Chem.* **55**, 4344 (2016).

M. van Horn, P. Smith, B. P. Mason, J. R. Hemmer, J. Read de Alaniz, J. P. Hooper, and S. Osswald. "Optical characterization and confocal fluorescence imaging of mechanochromic acrylate polymers." *J. Appl. Phys.* **117**, 043103 (2015).

A. Pollack, S. Alnemrat, T. Chamberlain, A. Khlobystov, J. P. Hooper, and S. Osswald. "Electronic property modification of single-wall carbon nanotubes by encapsulation of sulfur-terminated graphene nanoribbons." *Small* **10**, 5077 (2014).

J. R. Hemmer, P. D. Smith, M. van Horn, S. Alnemrat, B. P. Mason, J. Read de Alaniz, S. Osswald, and J. P. Hooper. "High strain-rate response of spiropyran mechanophores in PMMA." *J. Polym. Sci. B: Polym. Phys.* **52**, 1347 (2014).

D. J. Woo, J. P. Hooper, S. Osswald, B. A. Bottolfson, L. N. Brewer. "Low temperature synthesis of carbon nanotube-reinforced aluminum metal composite powders using cryogenic milling." *J. Mat. Sci.* 29, 2644 (2014).

S. Alnemrat and J. P. Hooper. "Ab initio metadynamics simulations of oxygen/ligand interactions in organoaluminum clusters." *J. Chem. Phys.* **141**, 144304 (2014).

S. Alnemrat and J. P. Hooper. "Oxidation of ligand-protected aluminum clusters: an ab-initio molecular dynamics study." *J. Chem. Phys.* **140**, 104313 (2014).

S. Alnemrat and J. P. Hooper. "Predicting solubility of military, homemade, and green explosives in pure and saline water using COSMO-RS." *Prop. Expl. Pyro.* **39**, 79 (2014).

S. Alnemrat, J. P. Hooper, I. Vasiliev, and B. Kiefer. "The role of equilibrium volume and magnetism on the stability of iron phases at high pressure." *J. Phys. Cond. Mat.* **26**, 046001 (2014).

S. Alnemrat, G. T. Brett, and J. P. Hooper. "Adsorption of 2,4,6-trinitrotoluene on the ZnO ($2\bar{1}\bar{1}0$) surface: a density functional theory study of the detection mechanism

of ZnO nanowire chemiresistors." *Appl. Phys. Lett.* **103**, 173102 (2013).

D. J. Woo, B. Sneed, F. Peerally, F. C. Heer, L. N. Brewer, J. P. Hooper, and S. Osswald. "Synthesis of nanodiamond-reinforced aluminum metal composite powders and coatings using high-energy ball milling and cold spray." *Carbon* **63**, 404 (2013).

S. Alnemrat and J. P. Hooper. "Predicting temperature-dependent solid vapor pressures of explosives and related compounds using a quantum chemical continuum solvation model." *J. Phys. Chem. A* **117**, 2035 (2013).

J. P. Hooper. "Impact fragmentation of aluminum reactive materials." *J. Appl. Phys.* **112**, 043508 (2012).

K. S. Williams, J. P. Hooper, J. M. Horn, J. M. Lightstone, H. Wang, Y. J. Ko, and K. H. Bowen. "Magnetic structure variation in manganese-oxide clusters." *J. Chem. Phys.* **136**, 134315 (2012).

K. S. Williams and J. P. Hooper, "Structure, thermodynamics, and energy content of aluminum-cyclopentadienyl clusters." *J. Phys. Chem. A* **115**, 14100 (2011).

J. Hooper, "Vibrational energy transfer in shocked molecular crystals." *J. Chem. Phys.* **132**, 014507 (2010).

C. Stoltz, B. Mason, and J. Hooper. "Neutron scattering study of internal void structure in RDX." *J. Appl. Phys.* **107**, 103527 (2010).

J. Koch, S. Piecuch, J. Carney, J. Lightstone, and J. Hooper. "Time-resolved measurements of near infrared emission spectra from explosions: pure PETN and PETN mixtures of silver and aluminum nanoparticles." *J. Appl. Phys.* **108**, 036101 (2010).

C. Konek, B. Mason, J. Hooper, C. Stoltz, and J. Wilkinson, "Terahertz absorption spectra of 1,3,5,7-tetranitro-1,3,5,7-tetrazocane (HMX) polymorphs." *Chem. Phys. Lett.* **489**, 48 (2010).

D. Fobes, T. J. Liu, Z. Qu, M. Zhou, J. Hooper, M. Salamon, and Z.Q. Mao. "Anisotropy of magnetoresistivities in $Sr_4Ru_3O_{10}$: Evidence for an orbital-selective metamagnetic transition." *Phys. Rev. B*, 81, 172402 (2010).

J. Hooper, R. Lee, S. Thuot, J. Jouet, J. H. Wilkinson, and J. G. Rogerson, "Impact fragmentation and combustion of porous aluminum spheres." *JANNAF Journal of Propulsion and Energetics*, 2009.

J. Jouet, R. Lee, J. Hooper. "Reactive materials at Indian Head Division, Naval Surface Warfare Center." *JANNAF Journal of Propulsion and Energetics*, 2009.

J. Hooper, E. Mitchell, C. Konek, J. Wilkinson. "Terahertz optical properties of the high explosive β-HMX." *Chem. Phys. Lett.* **467**, 309 (2009).

J. Hooper, V. Cooper, T. Thonhauser, and D.C. Langreth. "Predicting C-H/π interactions with nonlocal density functional theory." *Chem. Phys. Chem.* **9**, 891 (2008).

F. Zerilli, J. Hooper, and M. Kukla. "Ab initio studies of crystalline nitromethane under high pressure." *J. Chem. Phys.* **126**, 114701 (2007).

J. Hooper, M. H. Fang, M. Zhou, D. Fobes, N. Dang, Z. Q. Mao, C. M. Feng, Z.A. Xu, M.H. Yu, C.J. O'Connor, G.J Xu, N. Anderson, and M. Salamon. "Competing magnetic fluctuations in $Sr_3Ru_2O_7$ probed by Ti doping." *Phys. Rev. B* **75**, 060403 (2007).

D. Fobes, M. H. Yu, M. Zhou, J. Hooper, C. J. O'Connor, M. Rosario, and Z. Q. Mao. "Phase diagram of the electronic states of trilayered ruthenate $Sr_4Ru_3O_10$." *Phys. Rev. B*, **75**, 094429 (2007).

J. Hooper, M. Zhou, Z.Q. Mao, Y. Liu, R. Perry, and Y. Maeno. "Critical current of the Sr_2RuO_4-$Sr_3Ru_2O_7$ eutectic system." *Phys. Rev. B* **73**, 132510 (2006).

Z.Q. Mao, M. Zhou, J. Hooper, V. Golub, and C. O'Connor. "Phase separation in the itinerant metamagnetic transition of $Sr_4Ru_3O_{10}$." *Phys. Rev. Lett.* **96**, 011801 (2006).

J. Hooper, M. Zhou, Z.Q. Mao, R. Perry, and Y. Maeno. "Tunneling magnetoresistance studies of $Sr_3Ru_2O_7$." *Phys. Rev. B* **72**, 134417 (2005).

J. Hooper, Z.Q. Mao, R. Perry, and Y. Maeno. "Unusual oscillation in tunneling magnetoresistance near a quantum critical point in $Sr_3Ru_2O_7$." *Phys. Rev. Lett.* **92**, 257206 (2004).

J. Hooper, Z.Q. Mao, K.D. Nelson, Y. Liu, M. Wada, and Y. Maeno. "Anomalous Josephson network in the Ru-Sr_2RuO_4 eutectic system." *Phys. Rev. B* **70**, 014510 (2004).

M. Zhou, J. Hooper, D. Fobes, Z.Q. Mao, V. Golub, and C. O'Connor. "Electronic and magnetic properties of triple-layered ruthenate $Sr_4Ru_3O_{10}$ single crystals grown by a floating-zone method." *Mat. Res. Bull.* **40**, 942 (2005).

R. Fittipaldi, A. Vecchione, S. Fusanobori, K. Takizawa, H. Yaguchi, J. Hooper, R.S. Perry, and Y. Maeno. "Crystal growth of the new Sr_2RuO_4-$Sr_3Ru_2O_7$ eutectic system by a floating zone method." *J. Crystal Growth* **282**, 152 (2005).

Reviewed Conference Proceedings

J. P. Hooper, J. Kline, and M. Tang. "Impact fragmentation of reactive materials." *Proc. 16th Intl. Detonation Symposium*, in press.

J. P. Hooper and J. Kline. "The shattering velocity of reactive materials." *Classified Warheads and Ballistics Symposium*, in press.

S. Alnemrat and J. P. Hooper. "Modeling the stability and growth of metalloid clusters for energetic materials." AIP Conference Proceedings **1793**, 040026 (2017).

J. P. Hooper, J. R. Hemmer, B. P. Mason, S. Alnemrat, M. Whittaker, S. Arora, S. Helmy, and J. Read de Alaniz. "Thermochromic polymers as in-situ sensors for hot spots in explosive composites." *Proc. 15th Intl. Detonation Symposium*, pp. 1279-1284 (2014).

S. Alnemrat, J. P. Hooper. "Quantum molecular dynamics simulations of the oxidation of aluminum-cyclopentadienyl clusters." *J. Phys: Conf. Ser.* **500**, 172001 (2014).

J. P. Hooper, C. L. Milby, R. J. Lee, and R. J. Jouet. "High-velocity impact fragmentation of brittle, granular aluminum spheres." *Proc. Eng.* **58**, 663 (2013).

C. S. Stoltz, B. P. Mason, J. P. Hooper, "Nano-void volume linked to sensitivity of RDX explosive." NIST National Center for Neutron Research Annual Review, pg. 26, 2011.

S. Thuot, J. Wilkinson, R. Lee, J. Carney, J. Hooper, J. Lightstone, J. Jouet, and J. Rogerson, "Impact fragmentation and ballistics of pressed aluminum powder projectiles." *Shock Compression of Condensed Matter*, eds. M. Elert *et al*, 1011 (2009).

J. Wilkinson, S. Caulder, and J. Hooper. "Signatures for improvised explosive devices using terahertz spectroscopy." Proceedings of the NATO Specialist Meeting on THz Wave Technology for Stand-Off Detection of Explosives (SET-129), May 2008.

J. Hooper, N. Romero, and F. Zerilli. "Predicting noncovalent interactions with nonlocal density functional theory." *Shock Compression of Condensed Matter*, eds. M. Elert *et al*, 381 (2007).

Selected Presentations:

"Diagnostic and Timing Requirements for Understanding the Fragmentation and Combustion of Reactive Materials." **Invited Talk**, Cornell High Energy Synchotron Source Workshop, June 2020.

"Navy High Density Reactive Materials." **Invited Talk**, Lawrence Livermore National Lab, Livermore, CA Feb. 2020.

"Tuning the Breakup of Reactive Fragment Materials." **Invited Talk** at Materials Research Society Fall Meeting, Boston, MA, Dec. 2019.

"Fragment Recovery and Overpressure from a Reactive Material Cased Charge." Oral presentation at APS Shock Compression of Condensed Matter conference in Portland, OR, June 2019.

"Mechanical properties of reactive materials." JANNAF Workshop, Niceville, FL, Oct. 2018.

"Impact fragmentation of reactive materials." 16th International Detonation Symposium, Cambridge, MD, July 2018.

"The shattering velocity of reactive materials." Classified Warheads and Ballistics Symposium, Monterey, CA, August 2018.

"Fragmentation of Reactive Materials." **Invited talk**, Air Force Research Lab, Eglin AFB / University of Florida REEF Center, September 2017.

"Fragmentation and high-rate response of Navy reactive materials." Oral presentation at 47th JANNAF Combustion Subcommittee Meeting, Newport News, VA, May 2016.

"Microstructure and fragmentation of reactive materials." Oral presentation at JANNAF Reactive Materials Workshop, Arlington, VA, 2015.

"Modeling the growth and stability of metalloid clusters for energetic materials." Oral presentation at 2015 APS Shock Compression of Condensed Matter conference in Tampa, FL.

"Thermochromic materials as in-situ sensors for hot spots in explosive composites." Oral presentation at 2014 International Detonation Symposium, San Francisco, July

2014.

"Mapping hot spots and dynamic fracture in energetic composites using thermo- and mechanochromic polymers." **Invited talk**, Gordon Research Conference on Energetic Materials, 2014.

"Ab initio simulations of stability of organometallic, cluster-assembled materials." Invited talk at the DoD Technical Working Group on Computational Chemistry, March 7th 2014.

"Mechanochromic molecules as in-situ stress and temperature sensors for polymer composites." Oral presentation at 2013 APS Shock Compression of Condensed Matter conference in Seattle, WA.

"Quantum molecular dynamics simulations of the oxidation of aluminum-cyclopentadienyl clusters." Oral presentation at 2013 APS Shock Compression of Condensed Matter conference in Seattle, WA.

"Aluminum/water reactions under extreme conditions." **Invited talk at APS March Meeting, 2013, Baltimore MD**.

"High-velocity impact fragmentation of brittle, granular aluminum spheres." Oral presentation at Hypervelocity Impact Symposium in Baltimore, MD, September 2012.

"Scale-invariant behavior in the impact fragmentation of aluminum reactive materials." Seminar at Lawrence Livermore National Lab, December 16 2011.

"Early-time thermal events behind a shock front and their relation to explosive initiation." Invited talk at the 2011 APS Shock Compression of Condensed Matter conference in Chicago, Il, June 2011.

"Fractal behavior in the fragmentation of brittle reactive materials." Oral presentation at the 2011 APS Shock Compression of Condensed Matter conference in Chicago, Il, June 2011.

"On the role of phonon scattering processes in shock induced initiation." Oral presentation at 14th International Detonation Symposium, Coeur d'Alene, ID. April 2010.

"Impact fragmentation and combustion of porous aluminum spheres." Oral presentation at JANNAF 43rd Combustion Subcommittee Meeting, La Jolla, CA, December 10 2009.

"Vibrational energy transfer in shocked molecular crystals." Oral presentation at 2009 APS Shock Conference in Nashville.

"THz spectroscopy and ab initio modeling of explosives." Invited talk at 2009 Southeastern University Research Association meeting on Applications of Terahertz Technology in Washington, DC.

"Microscopic model of initiation." Technical review for NAVSEA, May 6 2009.

"Predicting noncovalent interactions with nonlocal density functional theory." 2007 Shock Compression of Condensed Matter Conference, Kona, HI.

"Ab initio studies of high pressure states of crystalline nitromethane." 2006 American Physical Society March Meeting.

"Tunneling studies of $Sr_3Ru_2O_7$." 2005 American Physical Society March Meeting.

"Andreev bound states in Sr_2RuO_4." Invited talk at the Spin-Triplet Superconductivity and Ruthenate Physics conference in Kyoto, Japan, October 2004.

"Unusual oscillation in tunneling magnetoresistance in $Sr_3Ru_2O_7$." 2003 American Physical Society March Meeting.

Theses Advised

CAPT Benjamin Miles, US Marine Corps
M.S. Applied Physics, June 2020
Thesis: Title Restricted.

ENS Owen Esposito, US Navy
M.S. Applied Physics, June 2020
Thesis: "Tin as a Shock-Melting Binder for Reactive Materials."

ENS Viktor Turner, US Navy
M.S. Applied Physics, June 2020
Thesis: Title Restricted.

LT Chris Price, US Navy
M.S. Mechanical Engineering, March 2020
Thesis: "On Expeditionary Warfare: Autonomously Deploying Effects on Buried Seabed Targets."
Student Award: NAVSEA Award for Excellence in Naval/Mechanical Engineering.

LT Wei-Ming Chiu, Taiwan Navy
M.S. Physical Oceanography, M.S. Engineering Acoustics, March 2020
Thesis: "Modeling Acoustic Propagation from Conical Shpaed and Standard Block Explosive Sources in Complex Ocean Environments."
Co-advisor with Derek Olson, Oceanography.

LT Jonathon Harrel, US Navy
M.S. Applied Physics, March 2020
Thesis: "Analyzing the Placement of Explosives for the Penetration of Underwater Infrastructure."
Student Award: NAVSEA Award for Excellence in Naval/Mechanical Engineering.

LT David West, US Navy
M.S. Applied Physics, December 2019
Thesis: "An Analytical Model for Hypersonic Water Impacts."

LT Nick Artabazon, US Navy
M.S. Applied Physics, June 2019
Thesis: Title Restricted.

LT Darien Green, US Navy
M.S. Applied Physics, June 2019
Thesis: "Performance of a 66mm Shaped Charge Against Buried Seabed Targets."

LT Aaron Bankus, US Navy
M.S. Mechanical Engineering, March 2019
Thesis: "Energy Release and Lethality Model for High-Density Reactive Material Fragments."

LT Miguel Lewis, US Navy
M.S. Mechanical Engineering, December 2018
Thesis: "Sintered and Polymer-Infused 3D Printed Aluminum Reactive Materials."

LT Daniel Kotei, US Navy
M.S. Mechanical Engineering, December 2018
Thesis: "Aluminum Reactive Material Warhead Casings."

CDR Warren Tomlinson, US Navy
Ph.D. Applied Physics, September 2017
Dissertation: "Ligand Effects in Aluminum Cluster-Based Energetic Materials."

MAJ Jason Dalziel, Canadian Army
M.S. Applied Physics, December 2017
Thesis: "Characterization of the M3 Reactive Material."

LT Patrick Stewart, US Navy
M.S. Mechanical Engineering, December 2017
Thesis: "Ballistics and Fragmentation of the M7 Reactive Material Against Oblique Targets."

LCDR Tabitha Booth-Seay, US Navy
M.S. Applied Physics, June 2017
Thesis: "Soft Catch and Fragmentation of Navy Reactive Materials."
Student Award: NAVSEA Award.

LT Tina Pryne, US Navy
M.S. Applied Physics, June 2017
Thesis: "The Development of a Mock Inert Navy High Density Reactive Material."
Student Award: With distinction.

LT Evan Valdyke, US Navy
M.S. Applied Physics, June 2017
Thesis: "Mitigating Damage from Reactive Material Impact."

LT Shane Hays, US Navy
M.S. Applied Physics, June 2017
Thesis: "Optimizing the Metal/Water Reaction in Shocked Slurries."

CDR Ming-lung (Leo) Shen, Taiwan Navy
M.S. Applied Physics, June 2017
Thesis: "The Role of Porosity and Annealing on the Dynamic Mechanical Properties of an Aluminum Reactive Material."

CAPT Caleb Brown, US Marine Corps
M.S. Applied Physics, June 2017
Thesis: "Marine Corps Artillery Effectiveness Against Surface Vessels."

MAJ Garrett Ebey, US Marine Corps

M.S. Applied Physics, June 2017
Thesis: "Modeling Non-Lethal Weapons Effects."
Student Award: Outstanding Thesis.

CAPT Wooseok Lee, Korean Army
M.S. Applied Physics, December 2016
Thesis: "The Effect of Annealing on the Dynamic Mechanical Properties of Aluminum Reactive Materials."
Student Award: International Student Award. Outstanding thesis. With distinction.

Mr. Nape Lentsoane, Armaments Corporation of South Africa
M.S. Applied Physics, December 2016
Thesis: "Bond and Charge Analysis of Aluminum Nanoclusters."

LT Joon Kim, US Navy
M.S. Applied Physics, June 2016
Thesis: "Improved density-functional tight binding potentials for metalloid aluminum clusters."
Student Award: NAVSEA Award.

CAPT Matt Krayewsky, US Marine Corps
M.S. Applied Physics, June 2016
Thesis: "Fragmentation and high-rate compression of Navy reactive materials."
Student Award: Outstanding thesis.

LT Brian Ocampo, US Navy
M.S. Applied Physics, June 2016
Thesis: "Analysis of thermite residues from the agent defeat penetrator payload."

Nurulloh Zemy Prasetyo, Indonesian Navy
M.S. Applied Physics, June 2016
Thesis: "The role of water content on ballistic penetration of sand by spherical projectiles."

Yan Fauzullah, Indonesian Navy
M.S. Applied Physics, June 2016
Thesis: "The role of water content on ballistic penetration of sand by spherical projectiles."

Blake McCracken, NAWC China Lake
M.S. Applied Physics, March 2016
Thesis: "Using detonation wave structure of PBXN-112 for explosive plane wave lens development."
Student Award: Outstanding thesis, with distinction.

LT Tyler Ostermeier, US Navy
M.S. Applied Physics, December 2015
Thesis: "Studies of the metal/water reaction in shocked slurries."

LT Rob Ross, US Navy
M.S. Applied Physics, June 2015
Thesis: "Mechanical properties of the Navy's baseline High Density Reactive Material."

LT Erik Chamberlain, US Navy

M.S. Applied Physics, June 2015
Thesis: "High strain-rate fracture and fragmentation of Navy High Density Reactive Material."

LT Antron Harper, US Navy
M.S. Applied Physics, June 2015
Thesis: "Thermochromic photoswitches for localized temperature sensing in hydroxyl-terminated polybutadiene."

LTJG Taylor R. Whitaker, US Navy
M.A. Defense Analysis, June 2015 (as Co-Advisor)
Thesis: "The role of water confinement on hull damage from underwater contact charges."

MAJ Max Champagne, Canadian Army
M. S. Applied Physics, December 2014
Thesis: "Synthesis and mechanical characterization of selected hydro- and organogels for energetic materials."

LT Sean Hanley, US Navy
M.S. Applied Physics, September 2014
Thesis: "Mechanism of shock-induced reaction in aluminum/water slurries."
Student Award: Outstanding thesis.

CAPT Greg Veteto, US Marine Corps
M.S. Applied Physics, June 2014
Thesis: "High strain-rate response of reactive material/epoxy composites."
Student Awards: NAVSEA award and degree with distinction.

CAPT SeanWoo Nam, Korean Army
M.S. Applied Physics, December 2013
Thesis: "High strain-rate response of freeze-cast composites."

LCDR Konstantinos Eleftheriou, Greek Navy
M.S. Applied Physics, December 2013
Thesis: "Material point method simulations of thermobaric materials."

LT Matthew van Horn, US Navy
M.S. Applied Physics, December 2013 (as co-advisor)
Thesis: "Optical characterization and confocal imaging of mechanochromic polymers."

LTjg Patrick Smith, US Navy
M.S. Applied Physics, June 2013
Thesis: "Mechanochromic molecules as in-situ stress and temperature sensors for high strain-rate loading of polymer composites."
Student Award: Johns Hopkins Applied Physics Laboratory Award for Excellence in Applied Physics Research

LTC Gary Brett, US Army
M.S. Applied Physics, June 2013
Thesis: "Ab initio simulations of TNT adsorption on the ZnO $[2\bar{1}\bar{1}0]$ surface."

LT Amy Lees, US Navy
M.S. Applied Physics, December 2012

Thesis: "Microstructure and dynamic loading of Navy reactive materials."

LT Brian Curran, US Navy (dual degrees)
M.S. Applied Physics, December 2012
Thesis: "An ab initio investigation of high-temperature aluminum-water reactions."
M.S. Mechanical Engineering
Thesis: "A study of aluminum hydroxide growth on H2-aluminum powder."

Yi Ming Tan, Defence Science and Technology Agency, Singapore
M.S. Applied Physics (with distinction), December 2012
Thesis: "Microstructure and dynamic failure properties of freeze-cast materials for thermobaric cases."

LT Atoui Oussama, Tunisian Army
M.S. Applied Physics, December 2012
Thesis: "Ballistics, fragmentation and combustion of aluminum reactive fragments."

LT Arbi Chokri, Tunisian Army
M.S. Applied Physics, December 2012
Thesis: "Ballistics, fragmentation and combustion of aluminum reactive fragments."

CAPT Filipe Peerally, US Marine Corps
M.S. Applied Physics, December 2012 (as co-advisor)
Thesis: "Synthesis and characterization of nanocomposite powders for cold spray deposition of lightweight metal armor."
Student Award: NAVSEA award.

LT. Rick Wilson, US Navy
M.S. Applied Physics, June 2012
Thesis: "High strain-rate fragmentation and post-mortem recovery of reactive materials in a single-stage gas gun."

LT. Chris Sova, US Navy
M.S. Applied Physics, June 2012
Thesis: "Synthesis and shock recovery of aluminum/nanodiamond metal matrix nanocomposites."

MAJ. Tyler Donnell, US Army
M.S. Applied Physics, June 2012
Thesis:"Synthesis and shock recovery of aluminum-carbon nanotube metal matrix nanocomposites."

Interns:
I have supervised approximately 45 high school, undergraduate, and graduate interns through Navy outreach programs (NREIP, SEAP). I generally have interns directly involved with our main, DoD-funded research. Nearly all have gone on to pursue degrees and/or careers in the physical sciences or engineering.

Service

- Local organizer for Ordnance and Ballistics Technical Working Group, held yearly at NPS (∼250 attendees).
- Associate Chair for Research, Physics Department. 2015-present.
- Chair, Explosive Ordnance Qualification/Certification Board. 2015-present.

- PhD Committee, NPS Physics. 2016-present.
- NPS High Performance Computing Advisory Board. 2011-present.
- Coordinator, Weapons specialization track, NPS Applied Physics Dept. 2011-present.
- Physics department hiring and chair reappointment committees.
- Reviewer for: J. Appl. Phys., J. Phys. Chem., Applied Spectroscopy, J. Chem. Phys., J. Energetic Materials, Fluid Phase Equilibria, Physica E, Advanced Optical Materials, Appl. Phys. Lett., Inorganics, Adv. Materials, Appl. Surf. Sci., Rev. Sci. Inst., J. Dynamic Behavior of Materials.
- Session chair for many sessions at APS Shock Compression of Condensed Matter, International Detonation Symposium, and other conferences in the field of explosives.