Michael J. DeVries Vermeer, Ph.D.

Curriculum Vitae

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PROFESSIONAL EXPERIENCE

The RAND Corporation

Physical Scientist 2019 – Present

Associate Physical Scientist 2015 – 2019

- Four years of experience leading and participating in studies assessing criminal justice technology and policy needs. Currently co-leading the Criminal Justice Requirements and Resources Consortium, a multi-year project for the National Institute of Justice housing the Priority Criminal Justice Needs Initiative. Primarily responsible for organizing and executing workshops that bring together practitioners in the law enforcement, courts, and corrections sectors of the criminal justice system to identify and prioritize their technology, law, and policy needs. Organized, facilitated, and published peer-reviewed reports from workshops examining issues in the criminal justice system with: the law enforcement response to homelessness; countering drug-impaired driving; law enforcement interactions with autonomous vehicles; data-informed jails; risk and needs assessment in prisons; digital evidence in remote data centers; use of electronic devices & communications in the courtroom; law enforcement use of social media & social network analysis; law enforcement use of video analytics and sensor fusion; top challenges of police executives; and law enforcement efforts to combat the opioid crisis.

- Applied expertise in science and technology to analysis of the national security implications of emerging technologies, with a focus on assessing risks and opportunities and identifying policy recommendations. Co-authored a report on the security implications of future quantum computing capability and adoption of post-quantum cryptography standards.

- Applied a diverse analytical skillset toward analysis in defense acquisitions and modernization planning in the Army, Navy, and Air Force. Performed cost, schedule, requirements, and effectiveness analyses for studies of defense acquisitions of naval ships; options for maritime domain awareness; and enterprise information systems for aviation maintenance and for facility operations. Provided analytical decision support for multiple military modernization planning studies.

- Provided program evaluation across a diverse set of organizations, including research organizations, Army and Air Force development planning institutions, national youth programs, and organizations in the intelligence community. Created, tested, and executed individual and group expert elicitation exercises and used logic models to help organizations better track and optimize progress toward their missions.

Northwestern University

Postdoctoral Research Fellow 2013 – 2015
Supervisor: Professor Kenneth Poeppelmeier

- Led synthesis project directed toward targeted discovery and characterization of novel inorganic, intermetallic compounds. The project led to the successful synthesis of four new air-sensitive ternary intermetallic compounds characterized primarily by single-crystal X-ray diffraction.
- Partnered with National Renewable Energy Laboratory scientists and the Center for Inverse Design in validation and further development of theoretical prediction of stability, structure, and properties of as-yet undiscovered inorganic materials.
- Performed high energy in-situ XRD with Argonne National Laboratory scientists at the Advanced Photon Source synchrotron.

Graduate Research Assistant 2007 – 2012
Advisors: Professor Joseph T. Hupp & Dr. Michael J. Pellin

- Managed and executed concurrent research projects including dye-sensitized solar cell construction and modification, solar fuel generation, novel thin film deposition techniques, and other research projects.
- Performed dye-sensitized solar cell device design and assessment, including interface engineering with thin-films and solution-based surface modifiers in collaboration with Argonne National Laboratory, and analysis of electron-transfer dynamics with novel electrolytes and nano-scale architectures.
- Trained and managed laboratory safety compliance for 20-30 group members as safety officer, including writing a new safety manual, ensuring OSHA compliance, and personally training new staff.

Teaching Assistant 2007 – 2008

- Lectured and instructed laboratory classrooms of 20 – 30 general chemistry students each quarter for 3 quarters. Instruction included pre-laboratory lectures, holding office hours, assisting during laboratory, and grading examinations and lab reports.
- Lectured and instructed laboratory sessions in course on advanced instrumental analysis, including topics such as GC-MS, mass spectrometry, HPLC, infrared spectroscopy, and inductively couple plasma spectrometry.

Science & Math Tutor 2012 – 2015

- Employed as a math and science tutor through the online tutoring portal, Wyzant. Tutored general and advanced chemistry and mathematics topics to undergraduate and advanced secondary students of Chicago-area schools.

Independent Research & Business Development 2013 – 2014

- Independently assembled chemistry research laboratory and performed primary R&D for new product development.
- Material and equipment acquisition, materials engineering, and business development.

EDUCATION

Doctor of Philosophy, Inorganic Chemistry 2012
Northwestern University Evanston, IL
Thesis: Interfacial Charge Transfer at the Semiconductor-Liquid Junction: Dye-Sensitized Solar Cells and Water Oxidation

Bachelor of Science 2007
Calvin College Grand Rapids, MI
Major: Chemistry

PUBLICATIONS

RAND Publications

1. Goodison, Sean E., Jeremy D. Barnum, **Michael J. D. Vermeer**, Dulani Woods, Siara I. Sitar, Shoshana Shelton, Brian A. Jackson, *Wearable Sensor Technology and potential uses within law enforcement: Identifying high-priority needs to improve officer safety, health, and wellness using Wearable Sensor Technology*. Santa Monica, Calif: RAND Corporation, RR-A108-7, forthcoming.
2. **Vermeer, Michael J. D.**, Dulani Woods, Brian A. Jackson, *Would law enforcement leaders support defunding the police? Probably – If communities ask police to solve fewer problems*. Santa Monica, Calif: RAND Corporation, PE-A108-1, 2020.
3. Goodison, Sean E., Jeremy D. Barnum, **Michael J. D. Vermeer**, Dulani Woods, Siara I. Sitar, Brian A. Jackson. *The law enforcement response to homelessness: Identifying high-priority needs to improve law enforcement strategies for addressing homelessness*. Santa Monica, Calif: RAND Corporation, RR-A108-6, 2020.
4. Russo, Joe, **Michael J. D. Vermeer**, Dulani Woods, Brian A. Jackson. *Assessing risks and reeds in Prisons*. Santa Monica, Calif: RAND Corporation, RR-A108-5, forthcoming.
5. Goodison, Sean E., Jeremy D. Barnum, **Michael J. D. Vermeer**, Dulani Woods, Tatiana Lloyd-Dotta, Brian A. Jackson. *Autonomous road vehicles and law enforcement: Identifying high-priority needs for law enforcement interactions with autonomous vehicles within the next five years*. Santa Monica, Calif: RAND Corporation, RR-A108-4, 2020.
6. Witwer, Amanda R., Lynn Langton, **Michael J. D. Vermeer**, Duren Banks, Dulani Woods, Brian A. Jackson. *Countering technology-facilitated abuse: Criminal justice strategies for combating nonconsensual pornography, sextortion, doxing, and swatting*. Santa Monica, Calif: RAND Corporation, RR-A108-3, 2020.
7. **Vermeer, Michael J. D**., and Evan D. Peet. *Securing communications in the quantum computing age: Managing the risks to encryption*. Santa Monica, Calif: RAND Corporation, RR-3102-RC, 2020.
8. Gourdet, Camille, **Michael J. D. Vermeer**, Michael G. Planty, Duren Banks, Dulani Woods, Brian A. Jackson. *Countering drug-impaired driving: Addressing the*

complexities of gathering and presenting evidence in drug-impaired driving cases. Santa Monica, Calif: RAND Corporation, RR-A108-2, 2020.

9. Russo, Joseph, **Michael J. D. Vermeer**, Dulani Woods, Brian A. Jackson. *Data-informed jails: Challenges and opportunities*. Santa Monica, Calif: RAND Corporation, RR-A108-1, 2020.
10. Jackson, Brian A., **Michael J. D. Vermeer**, Kristin Leuschner, Dulani Woods, John S. Hollywood, Duren Banks, Sean E. Goodison, Joe Russo, Shoshana R. Shelton. *Fostering innovation across the U.S. criminal justice system: Identifying opportunities to improve effectiveness, efficiency, and fairness*. Santa Monica, Calif: RAND Corporation, RR-4242-NIJ, 2020.
11. Wilson, Bradley, Jessie Riposo, Thomas Goughnour, Rachel M. Burns, **Michael J. D. Vermeer**, Ajay K. Kochhar, Angelena Bohman, Mel Eisman. *Naval Aviation Maintenance System: Analysis of alternatives*. Santa Monica, Calif: RAND Corporation, RR-2974/1-NAVY, 2020.
12. Leftwich, James A., Debra Knopman, Jordan R. Fischbach, **Michael J. D. Vermeer**, Kristin Van Abel, Nidhi Kalra. *Air Force capability development planning: Analytical methods to support investment decisions*. Santa Monica, Calif: RAND Corporation, RR-2931-AF, 2019.
13. Goodison, Sean E., **Michael J. D. Vermeer**, Jeremy D. Barnum, Dulani Woods, Brian A. Jackson. *Law enforcement efforts to fight the opioid crisis: Convening police leaders, multidisciplinary partners, and researchers to identify promising practices and to inform a research agenda*. Santa Monica, Calif: RAND Corporation, RR-3064-NIJ, 2019.
14. Hollywood, John S., Sean E. Goodison, **Michael J. D. Vermeer**, Dulani Woods, Brian A. Jackson. *Fostering innovation to respond to top challenges in law enforcement: Proceedings of the National Institute of Justice's 2019 Chiefs' Panel on Priority Law Enforcement Issues and Needs*. Santa Monica, Calif: RAND Corporation, RR-2930-NIJ, 2019.
15. Hollywood, John S., **Michael J. D. Vermeer**, Dulani Woods, Sean E. Goodison, Brian A. Jackson. *Using video analytics and sensor fusion in law enforcement: Building a research agenda that includes business cases, privacy, and civil rights protections and needs for innovation.* Santa Monica, Calif: RAND Corporation, RR-2619-NIJ, 2018.
16. Hollywood, John S., **Michael J. D. Vermeer**, Dulani Woods, Sean E. Goodison, Brian A. Jackson. *Using social media and social network analysis in law enforcement: Creating a research agenda including business cases, protections, and technology needs.* Santa Monica, Calif: RAND Corporation, RR-2301-NIJ, 2018.
17. **Vermeer, Michael J. D.,** Dulani Woods, Brian A. Jackson. *Identifying law enforcement needs for access to digital evidence in remote data centers.* Santa Monica, Calif: RAND Corporation, RR-2240-NIJ, 2018.
18. Dawson, Justin C., Duren Banks, **Michael J. D. Vermeer**, Shoshana Shelton. *Strategies to mitigate the impact of electronic communication and electronic devices on the right to a fair trial*. Santa Monica, Calif: RAND Corporation, RR-2155-NIJ, 2018.
19. Wenger, Jennie W., Louay Constant, Linda Cottrell, Thomas E. Trail, **Michael J. D. Vermeer**, Stephani Wrabel. *National Guard Youth ChalleNGe: Program progress in 2015-2016.* Santa Monica, Calif: RAND Corporation, RR-1848-OSD, 2017.

Scientific Publications

20. Trimarchi, Giancarlo, X. Zhang, **Michael J. D. Vermeer,** Jacqueline Cantwell, Kenneth R. Poeppelmeier, Alex Zunger. "Emergence of a few distinct structures from a single formal structure type during high-throughput screening for stable compounds: The case for RbCuS and RbCuSe." *Phys. Rev. B*, 2015, *92*, 165103.
21. **Vermeer, Michael J. D.,** X. Zhang, Giancarlo Trimarchi, Martin D. Donakowski, Peter J. Chupas, Kenneth R. Poeppelmeier, Alex Zunger. "Prediction and synthesis of strain tolerant RbCuTe crystals based on rotation of one-dimensional nano ribbons within a three-dimensional inorganic network." *J. Am. Chem. Soc.* 2015, *137(35)*, 11383 – 11390.
22. Katz, Michael J., **Michael J. D. Vermeer,** Omar K. Farha, Michael J. Pellin, Joseph T. Hupp. "Dynamics of back electron transfer in DSSCs featuring 4-tert-butylpyridine and atomic-layer-deposited alumina as surface modifiers." *J. Phys. Chem. B*, 2015 *119(24)*, 7162 – 7169.
23. Riha, Shannon C.,^ **Michael J. D. Vermeer,^** Michael J. Pellin, Joseph T. Hupp, Alex B. F. Martinson. "Hematite-based photo-oxidation of water using transparent distributed current-collectors." *ACS Appl. Mater. Interfaces*, 2013, *5(2)*, 360 – 367.
24. Katz, Michael J.,^ **Michael J. D. Vermeer,^** Omar K. Farha, Michael J. Pellin, Joseph T. Hupp. "Effects of adsorbed pyridine derivatives and ultrathin atomic-layer-deposited alumina coatings on the conduction band-edge energy of TiO_2 and on redox shuttled derived dark currents." *Langmuir*, 2013, *29(2)*, 806 – 814.
25. Martinson, Alex B. F., **Michael J. D. Vermeer**, Joseph A. Libera, S. T. Christensen, Joseph T. Hupp, Michael J. Pellin, Jeffrey W. Elam. "Atomic layer deposition of Fe_2O_3 using ferrocene and ozone." *J. Phys. Chem. C*, 2011, *115(10)*, 4333-4339.
26. **DeVries, Michael J.**, Michael J. Pellin, Joseph T. Hupp. "Dye-sensitized solar cells: driving-force effects on electron recombination dynamics with cobalt-based shuttles." *Langmuir*, 2010, *26(11)*, 9082-9087.
27. Vander Griend, Douglas A., K. Daniel Bediako, **Michael J. DeVries**, N. A. DeJong, P. L. Heeringa. "Detailed spectroscopic, thermodynamic, and kinetic characterization of nickel(II) complexes with 2,2'-bipyridine and 1,10-phenathroline attained via equilibrium-restricted factor analysis." *Inorganic Chemistry*, 2008, *47(2)*, 656-662.

Other Publications

1. Vermeer, Michael. "Want More Renewable Energy? Store It." Published online at Mic.com, 24 July, 2013. https://www.mic.com/articles/55595/want-more-renewable-energy-store-it

AWARDS AND PROFESSIONAL HONORS

Key Contributor to Gold Award, RAND Merit Bonus Award Program, 2016

Recognizing key analytical contributions to an Analysis of Alternatives for the Australian Navy through RAND's National Security Research Division.

Spotlight Innovation Award, RAND Internal Award, 2019

Recognizing innovative work developing a new method and tool for evaluating schedule risk in Department of Defense information system acquisitions.

Key Contributor to Bronze Award, RAND Merit Bonus Award Program, 2020

Recognizing key analytical contributions to a study on the Department of Homeland Security's plans for a backup to the domestic GPS system.

FUNDED RESEARCH PROPOSALS

"Criminal Justice Requirements and Resources Consortium," Department of Justice, National Institute of Justice, Award Number 2018-75-CX-K006, 1/2019-1/2024, $2,997,434 (Year 1 and 2 funding) (co-author)

"Quantum Computing and the Future of Encryption," Center for Global Risk & Security – Security 2040 Program (an internal RAND research center supported through private sector funding), 1/2018 – 1/2019, $90,665, (primary author).

PRESENTATIONS

- "AI, Quantum, Identity, and 5G: Forming a Trusted Ecosystem for a Cyber Moonshot." Panel presentation to the National Cyber Moonshot Ecosystem Workshop. Auburn, AL, November 21, 2019.
- "Law Enforcement Challenges with Digital Evidence Held in Remote Data Centers." Panel presentation to National Attorneys General Training & Research Institute. Washington, DC, June 11, 2019.
- "Securing Communications in the Quantum Computing Age." Presentation to the Center for Global Risk and Security Advisory Board. Arlington, VA. May 3, 2019.
- "Identity-Related Needs in Law Enforcement, Courts, and Corrections." AFCEA Homeland Security Conference and Federal Identity Expo. Washington, DC, September 2017.
- "Optimization of Solar Energy Conversion: Dye-sensitized Photovoltaics and Photoelectrochemical Water Oxidation." Northwestern Inorganic Chemistry Department Seminar. February, 2011.
- "Photoelectrochemical Water Oxidation with High Surface Area α–Fe_2O_3." Gordon Research Seminar (Renewable Energy: Solar Fuels), Ventura Beach, CA, January 2011.

OTHER PROFESSIONAL ACTIVITIES

National Cyber Moonshot

Advisory Board Member 2019 – present

- Advised on the makeup and agenda of a series of workshops implementing the recommendations of the National Security Telecommunications Advisory Committee report on a Cyber Moonshot.
- Led breakout session on priorities for post-quantum cryptography.

Light Up Africa
Technical Advisor 2013 - 2015

- Technical advising, including materials research and innovation, for a social enterprise startup aimed at commercializing alternative energy solutions on the continent of Africa.

Rocket Propulsion for the 21st Century Steering Committee Meeting 2015

Certificate in Business for Scientists and Engineers 2014
Kellogg School of Management Executive Education Program