Curriculum Vitae

MATTHEW DAVID YATES

Doctor of Philosophy, Environmental Engineering
Center for Bio/Molecular Science and Engineering
Naval Research Laboratory
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RESEARCH INTERESTS

Bioelectrochemical processes related to energy production and storage and the sustainability of water and environmental resources; interactions at the interface of biological and inorganic materials; biosynthesis of energy storage compounds and bio-nanomaterials; biologically assisted recovery of resources; using electro-active bacteria for remediation of contaminants

CURRENT POSITION

2016 to Present Research Biologist, Center for Bio/Molecular Science and Engineering, Code 6910

PAST POSITIONS

2016 National Research Council Postdoctoral Research Fellow at the Naval Research Laboratory
Supervisor: Dr. Leonard M. Tender
Research: Study mechanisms of electron transfer through living microbial biofilms and across the biofilm/electrode interface aimed at fundamental understanding of biological electron transfer and creation and optimization of biotechnologies. Understanding the interplay between biological and abiotic processes on electrode surfaces in bioelectrochemical systems.

EDUCATION

2014 Ph.D. in Environmental Engineering, The Pennsylvania State University, University Park, PA
Advisor: Dr. Bruce E. Logan
Dissertation Research: Using exoelectrogenic microorganisms and microbial electrochemical technologies (METs) as a platform for sustainable soluble metal recovery and bio-electrosynthesis of energy storage compounds.

2011 M.S. in Environmental Engineering, The Pennsylvania State University, University Park, PA
Advisor: Dr. Bruce E. Logan
Thesis Research: Investigation into the convergence of the anodic bacterial communities in microbial fuel cells (MFCs) inoculated from diverse sources (domestic wastewater vs. natural sediment) using a variety of molecular techniques (16S clone libraries, fluorescent *in situ* hybridization, denaturing gradient gel electrophoresis, and 454 pyrosequencing).

2009 B.S. in Biological and Agricultural Engineering, University of California, Davis, CA

PATENTS

Onderko EL, Yates MD, Magyar AP, Glaven SM, (2020). Biofilm Bioreactor. NAVY CASE NUMBER 112479; Serial number 62978428.

Glaven SM, Phillips DA, Tender LM, Yates MD (2020). Electrochemical Flow Cell Framework for Evaluating Electroactive Biofilms. NAVY CASE NUMBER 111917.

PUBLICATIONS

(†Denotes equal contribution.)

Leininger A, Yates MD, Ramirez M, Kjellerup BV* (2020). Long-term performance and community dynamics of an integrated upscaled wastewater biocathode microbial fuel cell. (in review).

Yates MD, Bird LJ, Onderko EL, and Glaven SM* (2020). Multiplexed characterization of electroactive biofilms at nanoliter scales. *Bioelectrochemistry* **137**: 107644.

Phillips D, Eddie BE, Bird LJ, Yates MD, Tender LM, Voigt CA, Glaven SM* (2020). Activation of protein expression in electroactive biofilms. *ACS Synthetic Biology* **9**: 1958-67.

Saunders SH, Tse ECM, Yates MD, Jimenez Otero F, Trammell SA, Stemp EDA, Barton JK*, Tender LM*, Newman DK* (2019). Extracellular DNA promotes efficient extracellular electron transfer by pyocyanin in *Pseudomonas aeruginosa* biofilms. *Cell* **182**: 919-32.e919.

Plegaria S†, Yates MD†*, Glaven SM, Kerfeld CA* (2019). Redox characterization of surface-bound bacterial microcompartment shell proteins engineered to bind metal centers. *ACS Applied Bio Materials* **3**: 685-92.

Jimenez-Otero F*, Yates MD, Tender LM (2019). Extracellular electron transport in Geobacter and Shewanella: A comparative analysis. In: Microbial Electrochemical Technologies, CRC Press: 3-14.

Onderko E, Philips D, Eddie BE, Yates MD, Wang Z, Tender LM, Glaven SM* (2019). Electrochemical characterization of Marinobacter atlanticus strain CP1 suggests a role for trace minerals in electrogenic activity. *Frontiers in Energy Research* **7**: 60.

Lebedev N, Stroud R, Yates MD, Tender LM* (2019). Spatially resolved chemical analysis of *G. sulfurreducens* cell surface. *ACS Nano* **13**: 4834-42.

Bird LJ, Onderko EL, Phillips DA, Mickol RL, Malanoski AP, Yates MD, Eddie BJ, Glaven SM* (2019). Engineered living conductive biofilms as functional materials. *MRS Communications* **9**: 505-17.

Golden JP, Yates MD, Halsted M, Tender LM* (2018). Application of electrochemical surface plasmon resonance (ESPR) to the study of electroactive microbial biofilms. *Physical Chemistry Chemical Physics* **20**: 25648-56.

Yates MD, Golden JP, Roy J, Strycharz-Glaven SM, Tsoi S, Erickson JS, El-Naggar MY, Calabrese Barton S, Tender LM* (2018). Characterizing electron transport through living biofilms. *Journal of Visualized Experiments* **136**: e54671.

Yates MD*, Barr-Engel S, Eddie B, Tender LM* (2018). Electron transport in mixed community anodic biofilms is redox-gradient driven. *FEMS Microbiology Ecology* **94**: fiy081.

Lebedev N, Yates MD, Griva I, Tender LM* (2018). Internal redox polarity of an individual *G. sulfurreducens* cell attached to an inorganic substrate (Front Cover). *ChemPhysChem* **19**: 1820-9.

Yates MD*, Lebedev N, Eddie B, Kotloski NJ, Strycharz-Glaven SM, Tender LM* (2017). On the relationship between long-distance and heterogeneous electron-transfer of electrode-grown *Geobacter sulfurreduce*ns biofilms. *Bioelectrochemistry* **119**: 111-8.

Yates MD*, Zhang Q, Sack J, Golden JP, Strycharz-Glaven SM, Yates SR, Tender LM (2017). Microbial electrochemical energy storage and recovery in a combined electrotrophic and electrogenic biofilm. *Environmental Science & Technology Letters* **4**: 374-9.

Yates MD, Eddie B, Kotloski NJ, Lebedev N, Malanoski AP, Lin B, Strycharz-Glaven SM, Tender LM* (2016). Toward understanding long-distance extracellular electron transport in an electroautotrophic microbial community. *Energy & Environmental Science* **9:** 3544-48.

Yates MD, Strycharz-Glaven SM, Golden JP, Roy J, Tsoi S, Erickson JS, El-Naggar MY, Calabrese Barton S, Tender LM* (2016). Electrochemical gating measurements of living electrode-grown *Geobacter sulfurreducens* biofilms. *Nature Nanotechnology* **11**: 910-3.

Phan H†, Yates MD†, Kirchhofer ND, Bazan GC, Tender LM, Nguyen T-Q* (2016). Biofilm as a redox conductor: A systematic study of moisture and temperature dependence of its electrical properties. *Physical Chemistry Chemical Physics* **18**: 17815-21.

Yates MD, Golden JP, Roy J, Strycharz-Glaven SM, Tsoi S, Erickson JS, El-Naggar MY, Calabrese Barton S, Tender LM* (2015). Thermally activated long range electron transport in living biofilms. *Physical Chemistry Chemical Physics*. **17**: 32564-70.

Yan H, Yates MD, Regan JM (2015). Effects of constant or dynamic anode potentials on microbial community development and composition. *Applied Microbiology and Biotechnology*. **99**: 9319-29.

Siegert M, Yates MD, Spormann A, Logan BE* (2015). Methanobacterium dominates biocathodic Archaeal communities in methanogenic microbial electrolysis cells. *ACS Sustainable Chemistry and Engineering* **7**:1668-76.

Zhu X, Siegert M, Yates MD, Logan BE* (2015). Alamethicin suppresses methanogenesis and promotes acetogenesis in bioelectrochemical systems. *Applied and Environmental Microbiology* **81**: 3863-68.

Siegert M, Li XF, Yates MD, Logan BE* (2014). The presence of hydrogenotrophic methanogens in the inoculum improves methane gas production in microbial fuel cells. *Frontiers in Microbial Ecology* **5**: 778.

Yates MD, Siegert M, Logan BE* (2014). Hydrogen evolution catalyzed by viable and non-viable cells on biocathodes. *International Journal of Hydrogen Energy* **39**: 16841-51.

Nam JY, Yates MD, Watson VJ, Zaybak Z, Logan BE* (2014). Examination of protein degradation in continuous flow, microbial electrolysis cells treating fermentation wastewater. *Bioresource Technology* **171**: 182-6.

Sun D, Wang A, Cheng S, Yates MD, Logan BE* (2014). *Geobacter anodireducens* sp. nov., a novel exoelectrogenic microbe in bioelectrochemical systems. *International Journal of Systematic and Evolutionary Microbiology* **64**: 3485-91.

Yates MD and Logan BE* (2014). Biotemplated palladium catalysts can be stabilized on different support materials. *ChemElectroChem* **1**: 1867-73.

Yates MD, Cusick RD, Logan BE* (2014). Exoelectrogenic biofilm as a template for sustainable formation of a catalytic mesoporous structure. *Biotechnology and Bioengineering* **111**: 2349-54.

Siegert M, Yates MD, Call DF, Zhu X, Logan BE* (2014). Comparison of non-precious cathode materials for methane production by electromethanogenesis. *ACS Sustainable Chemistry and Engineering* **2**: 910-7

Zhu X, Yates MD, Hatzell MC, Ananda-Rao H, Saikaly PE, Logan BE* (2014). Microbial community composition is unaffected by anode potential. *Environmental Science and Technology* **48**: 1352-8

Yates MD, Cusick RD, Logan BE* (2013). Extracellular palladium nanoparticles production using *Geobacter sulfurreducens*. *ACS Sustainable Chemistry and Engineering* **1**: 1165-71.

Yates MD, Kiely PD, Call DF, Rismani-Yazdi H, Bibby K, Peccia J, Regan JM, Logan BE* (2012). Convergent development of anodic bacterial communities in microbial fuel cells. *ISME Journal* **6**: 2002-12.

Zhu X, Yates MD, Logan BE* (2012). Set potential regulation reveals additional oxidation peaks of *Geobacter sulfurreducens* anodic biofilm. *Electrochemistry Communications* **22**: 116–9.

Liu G, Yates MD, Cheng S, Call DF, Sun D, Logan BE* (2011). Examination of microbial fuel cell start-up times with domestic wastewater and additional amendments. *Bioresource Technology* **102**: 7301-06.

Kiely PD, Call DF, Yates MD, Regan J, Logan BE* (2010). Anodic biofilms in microbial fuel cells harbor low numbers of higher-power-producing bacteria than abundant genera. *Applied Microbiology and Biotechnology* **88**: 371-80.

Zheng Y, Yates MD, Aung H, Cheng YS, Yu C, Guo H, Zhang R, VanderGheynst J*, Jenkins BM* (2011). Influence of moisture content on microbial activity and silage quality during ensilage of food processing residues. *Bioprocess and Biosystems Engineering* **34**: 987-95

Yates SR*, Ashworth DJ, Yates MD, Luo L (2011). Active solarization as a nonchemical alternative to soil fumigation for controlling pests. *Soil Science Society of America Journal* **75**: 9-16.

AWARDS

Outstanding Abstract Award, American Society for Microbiology, 2017
NRC/ASEE Postdoctoral Research Publication Award for "Thermally activated long range electron transport in living biofilms", 2016
National Research Council Postdoctoral Research Fellowship, 2014–2016
National Science Foundation Graduate Research Fellowship, 2010–2013
Outstanding Undergraduate student in Biological and Agricultural Engineering at the University of California, Davis, June 2009
Howard R Murphy Scholarship for Biological Systems Engineers at the University of California, Davis, 2009

MENTORING

GRADUATE
2018 Aaron Leininger, UMD, Thesis Committee Member
2017 Michelle Halsted, NREIP

UNDERGRADUATE
2018 Sarah Barr Engel, NREIP
2016 Sarah Barr Engel, NREIP
2015 Ciana Lopez, HBCU Internship

HIGH SCHOOL
2018 Luke Long, Regeneron Science Fair
2017 Luke Long, Intel ISEF
2016 Luke Long, Florida State Science Fair
2015 Luke Long, Florida State Science Fair
2014 Rita Lawal, Monmouth Junior Science Symposium
2013 Kelsey Lindbloom, Intel ISEF
2012 Alex Thompson, IJAS State Science Fair

2012 Marcus Gomez, Intel ISEF
2012 Gavin Mai, Intel ISEF
2011 Patrick Xia, North Jersey Regional Science Fair

PROFESSIONAL ORGANIZATIONS

2010 – present International Society for Microbial Electrochemistry and Technology
2016 – present American Society for Microbiology
2010 – 2014 Association of Environmental Engineering and Science Professors

SERVICE TO PROFESIONAL ORGANIZATIONS

2010 – present Ad hoc reviewer for various journals (Environ Sci & Technol, Water Research, ChemSusChem, TRENDS in Biotech, Bioelectrochemistry, PLoS One, etc.)
2016 Session Chair at The 229th Meeting of the Electrochemical Society
2015 Awards Committee for ISMET 5

PRESENTATIONS (*denotes invited)

***Yates, MD**. Electromicrobiology applications. Invited presentation at ASM Microbe 2020, Chicago, IL, June 2020. CANCELLED DUE TO COVID-19.

Yates, MD. High-throughput screening of engineered microorganisms based on electrochemical signatures. Oral presentation at SB4D 2019, Arlington, VA, September 2019.

Yates, MD. Toward utilizing bacterial microcompartments as a platform for enhanced catalysis. Poster presentation at ASM Microbe 2019, San Francisco, CA, June, 2019.

Yates, MD. Toward utilizing bacterial microcompartments as a platform for enhanced catalysis. Oral presentation at the Spring MRS Meeting 2019, Phoenix, AZ, April, 2019.

Yates, MD. Electrochemical characterization of *Geobacter sulfurreducens* electron transport pathway mutants. Poster presentation at The 3rd North American Regional Meeting of the International Society of Microbial Electrochemistry and Technology, St. Paul, MN, October 2018.

Yates, MD. Multiplexed, High-Throughput Assay for Screening Engineered Microorganisms. Poster presentation at SB4D Workshop 2018, Washington, DC, September 2018.

Yates, MD, Golden JP, Halsted M, Tender LM. Investigation of the interface of an electrode-grown microbial biofilm by electrochemical surface plasmon resonance spectroscopy. Poster presentation at ASM Microbe 2018, Atlanta, GA, June 2018.

Yates MD, Eddie B, Kotloski NJ, Lebedev N, Malanoski AP, Lin B, Strycharz-Glaven SM, Tender LM. Microbial electrochemical energy storage and recovery in a combined electroautotrophic and electrogenic biofilm. Oral presentation at The 6th International Meeting of the International Society of Microbial Electrochemistry and Technology, Lisbon, Pt, October 2017.

Yates, MD, Golden JP, Halsted M, Tender LM. Multiplexed, High-Throughput Assay for Screening Engineered Microorganisms Based on Surface Plasmon Resonance Imaging. Poster presentation at SB4D Workshop 2017, Washington, DC, September 2017.

Yates MD, Eddie B, Kotloski NJ, Lebedev N, Malanoski AP, Lin B, Strycharz-Glaven SM, Tender LM. Microbial electrochemical energy storage and recovery in a combined electroautotrophic and electrogenic biofilm. Oral presentation at Fall ACS Meeting, Washington, DC, August 2017.

Yates MD and Tender LM. Microbial-based energy harvesting. VIP Brief to the Deputy Assistant Secretary of the Navy - Energy Team. NRL Washington, DC, August 2017.

Yates MD, Eddie B, Kotloski NJ, Lebedev N, Malanoski AP, Lin B, Strycharz-Glaven SM, Tender LM. Toward understanding long-distance extracellular electron transport in an electroautotrophic microbial community. Poster presentation at ASM Microbe 2017, New Orleans, LA, June 2017.

Yates MD, Eddie B, Kotloski NJ, Lebedev N, Malanoski AP, Lin B, Strycharz-Glaven SM, Tender LM. Electron transport in an electroautotrophic biofilm. Oral presentation at The 3rd North American Regional Meeting of the International Society of Microbial Electrochemistry and Technology, Stanford, CA, October 2016.

Yates MD, Phan H, Tender LM, Nguyen T-Q. Electron transport in *in situ* and *ex situ* microbial biofilms. Oral presentation at the 229th Meeting of the Electrochemical Society, San Diego, CA, May 2016.

Yates MD, Strycharz-Glaven SM, El-Naggar MY, Calabrese Barton S, Tender LM. Thermally activated long range electron transport in living biofilms. Oral presentation at The 6th International Meeting of the International Society of Microbial Electrochemistry and Technology, Tempe, AZ, October 2015.

Yates MD, Strycharz-Glaven SM, El-Naggar MY, Calabrese Barton S, Tender LM. Thermally activated long range electron transport in living biofilms. Oral presentation at The 25th Goldschmidt Conference, Prague, Czech Republic, August 2015.

Yates MD, Siegert M, Logan BE. Hydrogen evolution catalyzed by biotic and dead microorganisms on biocathodes. Poster presentation at the North American Meeting of the International Society of Microbial Electrochemistry and Technology, University Park, PA, May 2014.

***Yates MD**. Sustainable resource recovery and energy conversion processes using microbial electrochemical technologies. Seminar presentation at the Department of Civil and Environmental Engineering, University of Maryland, College Park, MD, February 2014.

***Yates MD**. Sustainable resource recovery and energy conversion processes using microbial electrochemical technologies. Seminar presentation at the Department of Civil and Environmental Engineering, University of Vermont, Burlington, VT, January 2014.

Yates MD, Cusick RD, Logan BE. Exoelectrogenic biofilm as a template for the production of a catalytic mesoporous structure on a graphite electrode. Oral presentation at Association for Environmental Engineering and Science Professors 2013 Education and Research Conference, Golden, CO, July 2013.

Yates MD, Cusick RD, Logan BE. Reduction of soluble Palladium(II) to Palladium(0) nanoparticles by *Geobacter sulfurreducens*. Oral presentation at the Kappe Environmental Engineering Seminar at Penn State University, University Park, PA November 2012.

Yates MD and Logan BE. Pre-enrichment of *Geobacter sulfurreducens* to enhance the performance of microbial electrolysis cells. Oral presentation at North American Meeting of the International Society of Microbial Electrochemistry and Technology, Ithaca, NY, October 2012.

Yates MD, Kiely PD, Call DF, Rismani-Yazdi H, Bibby K, Peccia J, Regan JM, Logan BE. Convergence of anodic bacterial communities in microbial fuel cells. Poster presentation at International Society for Microbial Ecology 13, Copenhagen, Denmark, August 2012.

Yates MD and Logan BE. Pre-enrichment of *Geobacter sulfurreducens* to enhance the performance of microbial electrolysis cells. Poster presentation at Environmental Chemistry Student Symposium, University Park, PA, March 2012.

Yates MD, Kiely PD, Call DF, Rismani-Yazdi H, Bibby K, Peccia J, Regan JM, Logan BE. Convergence of anodic bacterial communities in microbial fuel cells. Poster Presentation at Association for Environmental Engineering and Science Professors Education and Research Conference, Tampa, FL, July 2011.

Yates MD and Logan BE. Convergence of anodic bacterial communities in microbial fuel cells. Poster presentation at Environmental Chemistry Student Symposium, University Park, PA, March 2011.

Yates MD and Logan BE. Convergence of MFCs with Different Inoculum Sources: Necessity of Replication. Oral presentation at the Kappe Environmental Engineering Seminar at Penn State University, University Park, PA, November 2010.

Yates MD, Zheng Y, and VanderGheynst JS. Effects of ensilage on storage and enzymatic degradability of sugar beet pulp. Poster Presentation at Society for Industrial Microbiology: 31st Symposium on Biotechnology for Fuels and Chemicals, San Francisco, CA, May 2009.