

David J. Bayless, Ph.D, P.E., FASME, FNAI
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Missouri University of Science and Technology

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Relevant Management and Leadership Experience

Leadership of largest academic department at Missouri S&T including all budgetary, alumni relations and fundraising, and all academic activities; mentoring and development of probationary faculty; responsibility for over \$20 million in sponsored research as PI; hiring and personnel management of professional engineering and administrative staff to support activities of two centers; technical administration for State of Ohio's Coal Development Office; supervised departmental administrative and technical staff, management and leadership of ECO₂Capture Inc. (startup company) – including acquisition of seed funding and interaction with clients; creation (Founding Chair) of the Engineering Leadership Development Division in ASEE PIC II.

Research Interests

Fostering innovation in the nexus of energy, water, and waste; development of students, staff and fellow faculty in their research and educational leadership through improvement of emotional intelligence and development of skills to be more effective leaders; development of photobioreactors for algal growth, carbon recycling and wastewater remediation; enhancing hydrocarbon recovery from hydraulically fractured shale formations; coal and biomass gasification via steam reforming; membrane-based wet electrostatic precipitation.

Educational History

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| 1987 | B.S.M.E. | University of Missouri at Rolla |
| 1992 | M.S. Engineering Management | University of Central Florida |
| 1995 | Ph.D. in ME (Drs. R.O. Buckius and J.E. Peters) | University of Illinois (Urbana) |
| 2004 | Ohio University Executive Leadership Institute | Voinovich School (Ohio) |

Professional Experience

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| 2021 | Chair and Professor, Mechanical and Aerospace Engineering | Missouri S&T |
| 1998-2020 | Director of the Ohio Coal Research Center | Ohio University |
| 2014-2020 | Graduate and P&T Chair, Mechanical Engineering | Ohio University |
| 2017 | Acting Chair, Mechanical Engineering Department | Ohio University |
| 2014 | Founding Chair, Engineering Leadership Development Division | ASEE |
| 2011-2020 | Champion, Energy Engineering B.S. Program | Ohio University |
| 2011-2020 | President, ECO ₂ Capture, Inc. | |
| 1995-2020 | Asst., Assoc. and Full (<i>Loehr</i>) Professor of Mech. Eng. | Ohio University |
| 2004-2020 | Associate Director and Director, Robe Leadership Institute | Ohio University |
| 2004-2020 | Fellow, Voinovich School for Leadership and Public Policy | Ohio University |
| 2000-2007 | Program Manager, State of Ohio Coal Research Consortium | |
| 2010-current | Director, Center for Algal Research and Commercialization | State of Ohio |
| 1996-1998 | Director, Project Probe | American Electric Power |
| 1995-current | Consultant for industrial, financial, policy and legal firms | |
| 1991-1994 | National Science Foundation Graduate Fellow | University of Illinois |
| 1986-1991 | Nuclear Propulsion Officer and Instructor | United States Navy |

Professional Memberships

- American Society for Engineering Education
- Air and Waste Management Association
- American Society of Mechanical Engineers
- Coal Utilization Research Council
- Sigma Xi
- Combustion Institute

Selected Awards

- 2016 Ohio Society of Professional Engineers Outstanding Engineering Educator (for entire State of Ohio)
- 2014 Elected to the rank *of Fellow, National Academy of Inventors*
- 2009, 2014 Russ College Outstanding Undergraduate Teacher, Ohio University
- 2007 Elected to the rank of *Fellow, American Society of Mechanical Engineers*
- 2007 Named Loehr Professor of Mechanical Engineering
- 2006 Invited Speaker, Energy Insurance Mutual 20th Anniversary Meeting; Invited reviewer - DOE NETL Fuel Processing Program Review
- 2005 Invited Speaker, Ohio Mineland Partnership Annual Meeting, Purdue University CCTR Project Review, DOE NETL Fuel Cell Review
- 2001-2019 Five time Ohio University "Top Faculty Newsmakers" awardee
- 2001 Russ Outstanding Research Paper, College of Engineering and Technology, O.U.
- 2001,5,10 White Outstanding Research Award, Mechanical Engineering, O.U.
- 2000 Invited panelist at the closing session of the American Power Conference
- 1998, 2006 White Outstanding Teaching Award, Mechanical Engineering, O.U.
- 1997-2001 Sponsored Faculty at the American Power Conference
- 1997-99, 2009 Outstanding Mechanical Engineering Professor, ENT Student Council, O.U.
- 1994-1995 Link Foundation Energy Graduate Fellow
- 1991-1994 National Science Foundation Graduate Fellow
- 1990 Navy Achievement Medal, U.S. Navy

Registration

Registered Professional Engineer (Missouri E-24997, Ohio E-65420).

Selected Patents and IP

- "Membrane Electrostatic Precipitator" US 6,231,643 (with H. Pasic, M.K. Alam), May 15, 2001.
- "Enhanced Practical Photosynthetic CO₂ Mitigation," US 6,667,171 (with M. Vis, G. Kremer) December 23, 2003.
- "Membrane Laminar Wet Electrostatic Precipitator," US 6,783,575, (with H. Pasic, M.K. Alam), August 31, 2004.
- "Solid Oxide Fuel Cell and Apparatus," US 8,057,951 (with M. Cooper and J. Trembly), November 15, 2011.
- "Apparatus and Method for Growing Biological Organisms for Fuel and Other Uses", US 8,470,584 and Japan 4,887,423 (with M. Vis, G. Kremer and B. Stuart), June 25, 2013
- "Flow Controlling Header for Delivering Fluid," 8,703,478 (with S. Switzer, M. Vis, G. Kremer and B. Stuart), April 22, 2014.
- "Sulfur Tolerant Anodes for Deployment of Coal Syngas with Planar SOFC for Stationary Power Generation," 60/664,735, (with J. Trembly), March 23, 2005.
- "High Temperature Carbon Recycling Gasification," 60/911,348, April 12, 2007
- "Hybrid system for enhancing algal growth using vertical membranes", 20130180166, March 10, 2010

- “Hybrid bioreactor for reduction of capital costs,” 20120070889, May 27, 2010
- “Carbon Dioxide Based Heat Pump for Water Purification,” 60/954,360, (with V. Gowreesan and C. Perrera) Aug. 7, 2007.
- “Method and System for Enhancing the Mass Transfer of a Soluble Gas,” 20170080379, March 23, 2017 (with Alex Lunka)
- “Method and System for Enhancing the Mass Transfer Rate of a Soluble Gas,” US 9,908,777, March 3, 2018

Selected Publications

- Lunka, A. and Bayless, D., “Use of Rotating Membranes for Air-to-Liquid Mass Transfer of CO₂ to Enhance Algal Growth,” submitted for publication in *Biomass and Bioenergy*.
- Didiano, T., Simpson, A., and Bayless, D., “Pedagogical approaches for facilitating engineering leadership development,” *New Directions for Student Leadership*, Volume 173, pp. 43-51, 2022, <https://doi.org/10.1002/yd.20478>
- Hatami, M., Bayless, D., and Sarvestani, A., “Poroelastic effects on gas transport mechanisms and influence on apparent permeability in shale,” *International Journal of Rock Mechanics and Mining Sciences*, Volume 153, pp. 105102-105110, 2022; <https://doi.org/10.1016/j.ijrmms.2022.105102>
- Drabold, E. and Bayless, D., “Quantitative Photoresponse of the First Photosynthetic Biomaterials: Physical Measurements and Analysis of Microalgae Systems,” *physica status solidi (b)*, Volume 258(9), 202; <https://doi.org/10.1002/pssb.202000475>
- Abu Hajer, A., and Bayless, D., “Inorganic carbon formation in rotating thin liquid films to support algal growth,” *Algal Research*, Volume 52, December 2020, 102109; <https://doi.org/10.1016/j.algal.2020.102109>
- Drabold, E., McGaughy, K., Agner, J., Sellars, D., Johnson, R., Abu Hajer, A., Reza, M.T , and Bayless, D., “Challenges and process economics for algal carbon capture with novel integration: Hydrothermal carbonization,” *Bioresource Technology Reports*, (12) Dec. 2020, 100556, <https://doi.org/10.1016/j.biteb.2020.100556>
- Hatami, M., Bayless, D., and Sarvestani, A. “A model for stress-dependence of apparent permeability in nanopores of shale gas reservoirs,” *AIChE J.* 2020; 66:e16541. <https://doi.org/10.1002/aic.16541>
- McGaughy, K., Abu Hajer, A., Drabold, D., Bayless, D., and Reza, M.T., “Algal Remediation of Wastewater Produced from Hydrothermally Treated Septage,” *Sustainability*, 11(12), pp. 3454-3458, 2019.
- Bayless, David. “*Engineering Leadership Development using an Interdisciplinary Competition-based Approach with Cross Functional Teams*,” Proceedings of the 2019 ASEE Annual Conference, Tampa, FL, Paper 32759, DOI 10.18260/1-2.32729, <https://peer.asee.org/32729>
- Hatami, M., Blake, L., Sarvestani, A., and Bayless, D., “Thermoelastic Analysis of Porous Media Using a Multiscale Asymptotic Expansion Homogenization Method,” *Proceedings of the 43rd Workshop on Geothermal Reservoir Engineering*, Stanford, California, February 2018
- Hatami, M., Sarvestani, A., and Bayless, D., “Numerical Analysis of Hydrocarbon Flow in Shale Gas Reservoirs,” Paper 713C, *AIChE Annual Conference*, Pittsburgh, PA, November 2018
- Dong, X., Tremblay, J., and Bayless, D., “Techno-Economic Analysis of Hydraulic Fracking Flowback and Produced Water Treatment in Supercritical Water Reactor,” *Energy*, vol. 133, pp 777-783, 2016.
- Bayless, D. Dasaard, C., Bayless, D., and Stuart, B., “Saturated pH and Total Inorganic Carbon from CO₂ Solubility Related to Algal Growth,” *International Advanced Research Journal in Science, Engineering and Technology*, vol. 3:11, pp. 146-150, 2016.

- Bayless, D. Dasaard, C., Bayless, D., and Stuart, B., “Experimental Measurement of Total Inorganic Carbon Concentrations from Absorption of Gas Phase CO₂,” *International Advanced Research Journal in Science, Engineering and Technology*, vol. 3:10, pp. 110-125, 2016.
- Bayless, David. “Integrating a Capstone Leadership Project and the S-Triangle Pedagogy to Guide Engineering Leadership Development Education,” Proceedings of the 2016 ASEE Annual Conference, New Orleans, Paper 15081. DOI 10.18260/p.25779, <https://peer.asee.org/25779>
- Tanim, T., Bayless, D., Trembly, J., “Modeling a 5 kWe planar solid oxide fuel cell based system operating on JP-8 fuel and a comparison with tubular cell based system for auxiliary and mobile power applications,” *Journal of Power Sources* vol. 245. p. 986-997, 2014
- Bayless, D. “Assessing the Effectiveness of Leadership Education for Engineering Students,” *Proceedings of the American Society of Engineering Education*, 10204, 2014
- Tanim, T., Bayless, D., Trembly, J., “Modeling of a 5 kWe tubular solid oxide fuel cell based system operating on desulfurized JP-8 fuel for auxiliary and mobile power applications,” *Journal of Power Sources* vol. 221. p. 387-396, 2013
- Lunka, A. and Bayless, D., “Effects of flashing light-emitting diodes on algal biomass productivity,” *Journal of Applied Phycology*, May, 2013, DOI 10.1007/s10811-013-0044-1
- De Silva, C., Kaseman, B., and Bayless, D., “Accelerated anode failure of a high temperature planar SOFC operated with reduced moisture and increased PH₃ concentrations in coal syngas,” *International Journal of Hydrogen Energy* **36:16**, pp. 9945-9955 (2011)
- De Silva, C., Kaseman, B., and Bayless, D., “Silver (Ag) as Anode and Cathode Current Collectors in High Temperature Planar Solid Oxide Fuel Cells,” accepted for publication in the *International Journal of Hydrogen Energy* **36:1**, pp. 779-786 (2011) – Citations 0
- Cooper, M., DeSilva, C., and Bayless, D. “Comparison of LSV/YSZ and LSV/GDC SOFC Anode Performance in Coal Syngas Containing H₂S,” *Journal of the Electrochemical Society*, 157 (11), pp. B1713-B1718 (2010)
- Bayless, D.J., Mitchell, J., and Robe, T.R., “Engineering Leadership Studies and the Robe Leadership Institute Model in the Russ College of Engineering and Technology at Ohio University,” Paper 1175, *Proceedings of the Frontiers in Education Conference*, San Antonio, TX, 2009
- Shi, L., Prudich, M. and Bayless, D., “A CFD Model of Autothermal Reforming,” *International Journal of Hydrogen Energy* (34) pp. 7666-7675, 2009
- Shi, L., and Bayless, D., “A Model of Steam Reforming of Iso-Octane: The Effect of Thermal Boundary Conditions on Hydrogen Production and Reactor Temperature,” *International Journal of Hydrogen Energy* (33) pp. 4577-4585, 2008
- Burnette, D.D., Kremer, G.G., and Bayless, D.J., “The Use of Hydrogen-depleted Coal Syngas in Solid Oxide Fuel Cells,” *Journal of Power Sources* (182) pp. 329-333, 2008
- (Invited) Bayless, D. “Bioremediation of Greenhouse Gases,” *World Ecology Report* (in consultation with the United Nations), Spring 2008, pp. 7-9
- Shi, L., Bayless, D., “Analysis of Jet Fuel Reforming for Solid Oxide Fuel Cell Applications in Auxiliary Power Units,” *International Journal of Hydrogen Energy* (33):3 pp. 1067-1075, 2008
- Trembly J., Gemmen R., Bayless D., “The Effect of Coal Syngas Containing AsH₃ on the Performance of SOFCs: Investigations into the Effect of Operation Temperature and AsH₃ Concentration,” *Journal of Power Sources* (171) pp 818-825, 2007
- Brown, I., Jones, J, Bayless, D., Sarkisova, S., Garrison, D., McKay, D., “Cyanobacteria for Human Habitation beyond Earth,” Proceedings of 7th European Workshop on Microalgal Biotechnology; NASA Paper 20070021574, 2007

- Zemke P.E., Wood B.D., Dye D.J., and Bayless, D., "Economic analysis of a vertical sheet algal photobioreactor for biodiesel production," 2007 Pages: 815-820 Published: 2007
- Cooper, M., and Bayless, D.J., Electrochemical H₂S Scrubbing of a Coal Syngas Fuel Stream via SOFCs, *Fifth International Conference on Fuel Cell Science, Engineering and Technology*, Paper FuelCell2007-25042, New York, June 2007
- (Invited) Trembly, J., Gemmen, R., and Bayless, D.J., The Effect of Trace Coal Syngas Species on the Performance of a Solid Oxide Fuel Cell, *Fifth International Conference on Fuel Cell Science, Engineering and Technology*, Paper FuelCell2007-25151, New York, June 2007.
- Trembly, J.P., Gemmen, R.S., Bayless, D.J., "The Effect of Coal Syngas Containing HCl on the Performance of Solid Oxide Fuel Cells: Investigations into the Effect of Operational Temperature and HCl Concentration," *Journal of Power Sources*, (169):2, pp.347-354, 2007
- Shi, L., Bayless, D., Kremer, G., and Stuart, B., "Numerical Investigations of the Flow Pattern in an Electrically Enhanced Cyclone," *Journal of the Air and Waste Management Association*, (57), pp. 489-496, 2007
- Shi, L. and Bayless, D., "Comparison of Boundary Conditions for Predicting the Collection Efficiency of Cyclones," *Powder Technology*, (173) pp. 29-37, 2007
- Trembly, J.P., Gemmen, R.S., Bayless, D.J., "The Effect of IGFC Warm Gas Cleanup System Conditions on the Gas-Solid Partitioning and Form of Trace Species in Coal Syngas and Their Interactions with SOFC Anodes," *Journal of Power Sources*, (163):2, pp 986-996, 2007
- Marquez, A., Ohrn, T., Trembly, J., Ingram, D., and Bayless, D., "Effects of Coal Syngas and H₂S on the Performance of Solid Oxide Fuel Cells: Part 2: Stack Tests," *Journal of Power Sources*, (164):2, pp 659-667, 2007
- Shi, L., Bayless, D., Kremer, G., and Stuart, B., "CFD Simulation of the Influence of Temperature and Pressure on the Flow Pattern in Cyclones," *Industrial & Engineering Chemistry Research*, (45) pp. 7667-7672, 2006.
- Bayless, D.J., Kremer, G., Vis, M., Stuart, B., Shi, L., Cuello, J., Ono, E., "Photosynthetic CO₂ Mitigation using a Novel Membrane-based Photobioreactor," *Journal of Environmental Engineering and Management*, (16)4, pp. 209-215, 2006
- Avetisyan, M., Bayless, D., and Gnuni, T., "Optimal Expansion of Developing Power System under the Conditions of Market Economy and Environmental Constraints," *Energy Economics*, (28) pp. 455-466, 2006
- Trembly, J., Marquez, A., Ohrn, T., and Bayless, D., "Effects of Coal Syngas and H₂S on the Performance of Solid Oxide Fuel Cells: Single-cell tests," *Journal of Power Sources*, (158) pp. 263-273, 2006
- Trembly, J.P., Gemmen, R.S., Bayless, D.J., "A Study of the Transport of Coal Syngas Species Through a Solid Oxide Fuel Cell Anode," *Proceedings of the 23rd Annual International Pittsburgh Coal Conference*, paper 35-1, Pittsburgh, PA, 2006.
- Trembly, J.P., Gemmen, R.S., Bayless, D.J., "The Effect of a Current Collection Layer Containing a Sulfur Tolerant Material On the Operation of a PSOFC Utilizing Coal Derived Syngas Containing H₂S as Fuel," *Proceedings of the 23rd Annual International Pittsburgh Coal Conference*, paper 35-5, Pittsburgh, PA, 2006.
- Bayless, D., Shi, L., Kremer, G., Stuart, B. Reynolds, J., and Caine, J., "Membrane-Based Wet Electrostatic Precipitation," *Journal of the Air and Waste Management Association*, (55)6, pp. 784-791, 2005.
- Beshars, D., Earl, D., Muhs, J., Maxey, C., Capps, G., Stellern, S., Bayless, D., Switzer, S., "First Generation Hybrid Solar Lighting Collector System Development and Operating

- Experience,” *Proceedings of SPIE – The International Society for Optical Engineering*, (5185), pp. 56-66, 2005.
- Bayless, D., Shi, L., Kremer, G., Stuart, B., “Membrane-Based Wet Electrostatic Precipitation – Results from Pilot Testing Experience,” *Conference on Air Quality V*, Washington D.C., Sept. 2005.
- Shi, L., Kremer, G., Bayless, D., “Hot Gas Cleanup using Electrostatic Separation.” *Proceedings of the 22nd Annual International Pittsburgh Coal Conference*, paper 33-2, Pittsburgh, PA, 2005.
- Li, K., Shi, L., Kremer, G., Bayless, D., “Acid Aerosol and Other Fine Particulate Control with Wet Laminar Electrostatic Precipitation.” *Proceedings of the 22nd Annual International Pittsburgh Coal Conference*, paper 23-3, Pittsburgh, PA, 2005.
- Bayless, D.J., Kremer, G.G., Vis, M., Stuart, B.J., Prudich, M.E., Cooksey, J.E., and Muhs, J.S., “Enhanced Practical Photosynthetic CO₂ Mitigation,” *Third Annual Conference on Carbon Sequestration*, Alexandria, VA, May 3, 2004.
- Beshears, D., Earl, D., Muhs, J., Maxey, C., Capps, G., Stellern, S., Switzer, S., and Bayless, D., “First-generation hybrid solar lighting collector system development and operating experience,” *Proceedings of the Society of Photo-optical Instrumentation Engineers*, SPIE 5185:56-59, San Diego CA, 2004
- Bayless, D., Alam, M.K., Radcliff, R., and Caine, J., “Membrane-based Wet Electrostatic Precipitation,” *Fuel Processing Technology* (85)6-7, pp. 781-798, 2004.
- Stuart, B., Kremer, G., Shi, L., Caine, J., Kish, P., Reynolds, J., Ray, I., Doonan, P., and Bayless, D. “Pilot Testing Results of Membrane-Based Wet Electrostatic Precipitation for Multipollutant Control,” *Proceedings of the 29th International Technical Conference on Coal Utilization & Fuel Systems*, 2004.
- Trembly, J., Marquez, A., Stuart, B., Botte, G., Kremer, G., and Bayless, D., “Adapting Planar Solid Oxide Fuel Cells for use with Solid Fuel Sources in the Production of Distributed Power,” *Proceedings of the 29th International Technical Conference on Coal Utilization & Fuel Systems*, 2004.
- Stopek, D., Bayless, D., and Wilson, S., “Coal Gasification for Combined Heat Power Applications,” *CIBO - Industrial Emissions Technology Conference*, Charlotte, NC, Aug. 2003.
- Bayless, D.J., Kremer, G.G., Vis, M. Stuart, B.J., Prudich, M.E., Cooksey, J.E., and Muhs, J.S., “Enhanced Practical Photosynthetic CO₂ Mitigation,” *First Annual Hybrid Lighting Summit*, Oak Ridge, TN, Oct. 7, 2003.
- Caine, J., Bayless, D. and Reynolds, J., “Comparison of Metallic vs. Membrane-Based Wet ESP Technology for PM_{2.5}, SO₃ Mist and Mercury Control at a Coal-Fired Power Plant,” *Conference on Air Quality IV*, Washington D.C., Sept. 2003.
- Bayless, D., Shi, L., and Stuart, B., “Membrane-Based Wet Electrostatic Precipitation,” *Proceedings of the 28th International Technical Conference on Coal Utilization & Fuel Systems*, pp. 899-910, March 2003.
- Shi, L., Alam, M.K., and Bayless, D.J., “Mercury Removal using Titania-coated Membrane Collectors in Electrostatic Precipitators,” *Proceedings of the Eighteenth Annual International Pittsburgh Coal Conference*, paper 30-02, 2002.
- Bayless, D.J., and Caine, J., “Membrane-Based Wet Electrostatic Precipitation,” *Proceedings of the 3rd International Conference on Air Quality*, Section B.3, 2002.
- (Invited) Bayless, D.J., and Caine, J., “Emerging Technologies - New Design Wet Membrane Electrostatic Precipitator,” *2001 Particulate Control User's Group Conference*, July 2001.

- Pasic, H., Bayless, D.J., and Alam, M.K., "Membrane Based Electrostatic Precipitation," *Filtration and Separation*, 39, pp. 28-31, 2001.
- Bayless, D.J., Pasic, H., Alam, M.K., Shi, L., Haynes, B., Cochran, J., and Khan, W. "Use of Membrane Collectors in Electrostatic Precipitators," *Journal of the Air and Waste Management Association*, 51, pp. 1401-1407, 2001.
- Bayless, D.J., Kremer, G.G., Vis, M., Stuart, B.J., Prudich, M.E., Cooksey, J.E., and Muhs, J.S., "Enhanced Practical Photosynthetic CO₂ Mitigation," *Proceedings of the Eighteenth Annual International Pittsburgh Coal Conference*, paper 35-05, 2001.
- Bayless, D.J., "The Ohio Coal Research Consortium," *Proceedings of the 26th International Technical Conference on Coal Utilization & Fuel Systems*, pp. 507-518, 2001.
- Bayless, D.J., Pasic, H., and Alam, M.K., "Membrane-based Wet Electrostatic Precipitation," *Proceedings of the 26th International Technical Conference on Coal Utilization & Fuel Systems*, pp. 519-530, 2001.
- Bayless, D.J., Jewmaidang, J., Tanneer, S., and Birru, R., "Kinetics of Low Temperature Homogeneous SO₃ Formation for use in Flue Gas Conditioning for Improved Electrostatic Precipitator Performance." *Proceedings of the Combustion Institute*, 28, pp. 2499-2505, 2000.
- Bayless, D.J., "Analysis of the Evolution of Surface Voids Affecting Char Burning Rates at Diffusion-Limited Conditions," *Combustion Science and Technology*, 154, pp. 275-293, 2000.
- Bayless, D.J., Khan, A.R., Tanneer, S., and Birru, R., "An Alternative to Additional SO₃ Injection for Fly Ash Conditioning," *Journal of the Air and Waste Management Association*, (50):3, pp.169-174, 2000.
- Bayless, D.J., "Using Industrial Summer Intern Programs as a Tool for Engineering Education," *Journal of Engineering Education*, (88):4, pp. 465-470, 1999.
- Bayless, D.J., Brumfield C.A., Pierson, W., "American Electric Power's Summer Intern Program: Project Probe," *Proceedings of the American Power Conference*, 61, paper 27(a), 1999.
- Bayless, D.J., and Khan, A., "Effects of Gas Stream Temperature on Homogeneous SO₂ to SO₃ Conversion via Natural Gas Reburning," *Proceedings of the International Joint Power Generation Conference*, pp. 147-153, 1998.
- Bayless, D.J., "American Electric Power's Project ProbeSM - Academic-Industrial Cooperation to Improve Power Engineering Education," *Proceedings of the International Joint Power Generation Conference*, pp. 467-471, 1998.
- Bayless, D.J., and Pawliger, R.I., "American Electric Power's Project Probe - Enhancing Power Engineering Education Through Industrial-Academic Cooperation," *Proceedings of the Frontiers in Education Conference*, pp. 873-878, 1997.
- Bayless, D.J., and Pawliger, R.I., "American Electric Power's Project Probe - Enhancing Power Engineering Education Through Industrial-Academic Cooperation," *Proceedings of the Frontiers in Education Conference*, pp. 1230-1235, 1998.
- Bayless, D.J., and Brumfield C.A., "American Electric Power's Project Probe - Power Engineering Education through Internship," *Proceedings of the American Power Conference*, 60, pp. 146-150, 1998.
- Bayless, D.J., "Revitalizing Power and Power Generation Engineering Education at Ohio University," *Proceedings of the American Power Conference*, 60, pp. 151-154, 1998.
- Bayless, D.J., Wismer, M., and Sheidler, R., "American Electric Power's Project Probe - A Unique Summer Intern Engineering Program," *Proceedings of the American Power Conference*, pp. 493-498, 1997.

- Bayless, D.J., and Clark, L., "Using CEMS Data to Estimate Instantaneous Heat Rate" *Proceedings of the American Power Conference*, 59, pp. 987-992, 1997.
- Bayless, D.J., Schroeder, A.R., Peters, J.E., and Buckius, R.O., "The Effects of Surface Voids on the Burning Rates of Coal Particles at Diffusion-Limited Conditions," *Combustion and Flame*, (108), pp. 187-198, 1997.
- Bayless, D.J., Schroeder, A.R., Olsen, M.G., Johnson, D.C., Peters, J.E., Krier, H., and Buckius, R.O., "The Effects of Natural Gas Cofiring on Sulfur Retention in Ash," *Combustion and Flame*, (106), pp. 231-240, 1996.
- Bayless, D.J., "Effects of Natural Gas and Coal Cofiring on Sulfur Retention in Ash," *Research Reports of the Link Energy Fellows*, (11), pp. 25-44, 1995.
- Bayless, D.J., Schroeder, A.R., Johnson, D.C., Peters, J.E., Krier, H., and Buckius, R.O., "Effects of Natural Gas Cofiring on Ignition of Coal and Coke Particles," *Combustion Science and Technology*, (98), pp. 185-196, 1994.

Recent Research Projects (* denotes PI)

- Regolith Beneficiation System for Production of Lunar Calcium and Aluminum, with Daoru Han (PI), Fateme Rezaei, Jeffrey D. Smith, William Schonberg, and Leslie Gertsch, NASA Grant 80NSSC22K0738, \$1,980,000, 05/01/22-04/30/24
- * Techno-Economic Assessment of Ohio Coal as a Source of Carbon Dioxide for use in Enhanced Ohio Recovery in the Utica-Point Pleasant Oil Window, with J. Trembly, Ohio Development Services Agency, \$160,000, 01/01/2018 through 12/31/2019
- Honda R&D Carbon Recycling using Algae (Joel Agner and Dan Sellars, P.I.s) Honda R&D Americas Ohio, \$271,000, November 2017-January 2019.
- * Preventing a Bust: Innovations for Sustainable & Enhanced Economic Outcomes from Shale, with J. Trembly, T. Reza, K. Crist, M. Singer, S. Nesic, S. Miller, M. Zimmer, E. Welch, D. Karney, B. Bai, \$1,380,000, Ohio Innovation Strategies, 05/01/2016-04/30/2019
- * Integrated Water Pollutant Remediation and CO₂ Recycling Using Engineered Algal Systems, \$200,000, Ohio Water Development Authority, 01/01/2018-12/31/2018.
- Ohio Coal-based Plastic Composites, with K. Kappagantula and J. Trembly (PI), \$160,000, State of Ohio Coal Development Office, 08/10/2015 to 12/31/2017.
- Ohio Shale Platform: Cost Effective Treatment of Shale, with J. Trembly (PI), \$1,450,000, State of Ohio Development Agency (Ohio Third Frontier), 11/17/2014 to 03/31/2018.
- Advanced Integrated Technologies for Treatment and Reutilized of Impaired Water in Fossil Fuel-based Power Plant Systems, with J. Trembly (PI), \$750,000, U.S Department of Energy, 08/10/2015 to 02/28/2017.
- * Ohio Center for Algae Research and Commercialization, \$2,951,000, State of Ohio Third Frontier, 10/01/2010-9/30/2016
- Low Energy Harvesting and Dewatering of Microalgae, with B. Stuart (PI) and G. Riefler, U.S. Department of Energy (ARPA-E) via sub-contract from Algaeventure Systems, 01-15-2010-01/01-2011, \$545,444.
- * Ohio Research Scholars Program – Endowed Chair in Coal Syngas Utilization, \$4,920,000 (Ohio University portion, Bayless PI), joint proposal with Ohio State University (and their endowed chair in geological sequestration), 06/15/2008-06/14/2013.
- * Development of Sustainable Biorefining, U.S. Department of Energy, \$1,935,000, DE-FG36-08GO88083, 08/01/08-08/31/12, with B. Stuart.
- Corrosive Properties and Suitability for Compression of Separated CO₂, Ohio Coal Development Office, \$159,622, 9/1/07-8/31/09 (with Srdjan Nesic, PI)
- * Ohio Coal Research Consortium, Ohio Coal Development Office, \$7,435,332, 9/1/00-9/30/07.

- * Development of Sulfur Tolerant Anodes for Deployment of Coal Syngas with Planar Solid Oxide Fuel Cells for Stationary Power Generation, Ohio Coal Development Office, \$159,882, 9/1/05-8/31/07, with J. Trembly.
- Sulfur Tolerance and Improved Performance in SOFCs for Aerospace Applications, NASA, \$154,846 (of \$786,542 total award), 4/1/06-3/31/08, led by Mark DeGuire (Case Western).
- * Distributed Hydrogen Production, U.S. Dept. of Energy, \$1,091,000, DE-FG36-03GO13059, 9/1/05-8/31/08, with G. Botte, G. Kremer, M. Prudich, B. Stuart, and S. Rackey.
- Hot Gas Cleanup Using Electrostatic Separation, Ohio Air Quality Development Authority (OCRC4), \$139,931, 9/1/04-9/30/06 (with G. Kremer).
- Hydrogen Production from Coal-Derived Syngas by Proton-Conducting Ceramic Membranes, Ohio Air Quality Development Authority (OCRC4), \$159,980, 9/1/04-9/30/06 (with V. Guliants and J. Lin, PI, both at University of Cincinnati).
- Midwest Center for Emerging Power Technologies, \$35,223, 3/1/05-8/31/06, Part of \$785,000 award from the National Science Foundation, Stark State University lead (with G. Botte, PI, M. Prudich, and A. Foley).
- * Adapting Planar Solid Oxide Fuel Cells for use with Solid Fuel Sources in the Production of Distributed Power, United States Department of Energy, DE-FG36-03GO13059, \$3,910,000, 8/13/03-9/30/07.
- * Adaptive Full Spectrum Solar Energy Systems (University of Nevada Reno is the lead institution in this \$3,085,000 project), United States Department of Energy DE-FC26-01NT41154, \$199,000, 6/1/01-8/31/05.
- * Enhanced Practical Photosynthetic CO₂ Mitigation, United States Department of Energy DE-FC26-00NT40932, \$1,075,100, 9/1/00-2/28/05 (with M. Vis, G. Kremer, and B. Stuart).
- Consortium for Energy, Economics and the Environment, Ohio University Research Priorities, \$550,000, 1/1/05-12/31/09 (with M. Weinberg PI, K. Crist, M. Stoertz, G. Mapes, and S. Miller).
- * Capture of Air Toxics by Membrane Electrostatic Precipitation with Reagent, Ohio Air Quality Development Authority (OCRC3), \$50,000, 9/1/03-9/30/04 (with B. Stuart).
- Development of a Membrane-Based Electrostatic Precipitator, United States Environmental Protection Agency, \$225,000, 8/1/00-7/31/02 (with M.K. Alam and H. Pasic, PI).
- Membrane-based Wet Electrostatic Precipitation, sponsored by the Ohio Coal Development Office, \$310,000, 9/1/98-9/30/02 (with M.K. Alam and H. Pasic, PI).
- * Multi-Pollutant Control Using Membrane-Based Up-flow Wet Electrostatic Precipitation, (Croll-Reynolds is the lead institution on this \$535,000 project), United States Department of Energy DE-FC26-02NT41592, \$117,000, 10/1/02-3/31/04.
- * Fine Particulate and Acid Aerosol Control using a Novel Laminar Membrane Precipitator, Ohio Coal Research Consortium (OCRC3), Ohio Coal Development Office, \$79,585, 9/1/02-9/30/03 (with L. Shi).
- * Capture of Air Toxics by Membrane Electrostatic Precipitator, sponsored by the Ohio Coal Development Office, \$139,250, 9/1/01-9/30/03.
- * Post-Doctoral Researcher for the Ohio Coal Research Center, Ohio University, \$29,513, 8/1/00-7/31/02 (with G. Kremer and M. Prudich).
- * Role and Fate of Sulfur in Gas Reburning for NO_x Control, Ohio Coal Development Office, \$287,000, 9/1/96-9/30/00 (with M. Prudich).
- * Carbon Dioxide Mitigation through Controlled Photosynthesis, U.S. Department of Energy (FETC) \$50,000, 9/1/99-8/31/00 (with M. Vis).
- * Flow Loop Reactor for Promoting Photosynthetic Carbon Sequestration, Stocker Endowment, \$11,000, 7/1/01-6/30/02.

Proposal for Collaborative Work of OU with Southern Environmental, Inc. Phase I Research Proposal: Novel, Membrane-Based Wet ESP, Ohio University Foundation, \$34,000, 3/1/00-3/1/01 (with M.K. Alam and H. Pasic, PI).

* Enhanced Air Pollution Control using Electrostatic Precipitators, funded through the Ohio University 1804 Fund, \$28,500, 9/1/98 (with H. Pasic and M.K. Alam).

Service Work

Chair, Russ College Promotion and Tenure Advisory Committee, 2016-2019

Leadership Board, Athens First United Methodist Church (Ohio), June 2016-2019

Founding Chair, *Engineering Leadership Development* Committee, ASEE, 2011-2014 (and past Chair until June 2016)

Central Region National Vice-President, Pi Tau Sigma, 2004-2011

Chair of Faculty Champions, Ohio Foundation Board 1804 Fund Drive, 2010-2011

Chair, RCENT Co-operative Education Committee, 2006-current

Reviewer for various DOE, NSF, ARPA-E, and AAAS (EPSCoR) solicitations

Reviewer for several publications, including *International Journal of Hydrogen Energy*, *Journal of Power Sources*, *Journal of the Air and Waste Management*, *Biotechnology and Bioengineering*, *Environmental Science and Technology*, *Combustion and Flame*, and *Energy Economics*.

Search Committee, Executive Vice President for Development at Ohio University, 2006.

Executive member, Provost Search Committee for Ohio University, 2001-2002 and 2004-2005.

Search Committee, Director of External Relations for Russ College of Engineering, 2002.

Search Committee, Director of Budget and Planning for Russ College of Engineering, 2001.

ASME Region V Industrial Relations Chairman, 1995-1998.

ASME FACT CIAR (Committee on Industrial-Academic Relations) National Vice-Chair, 1998.

Pi Tau Sigma (Ohio Alpha Omicron Chapter of the M.E. Honor Society) charter advisor and advisor to the Ohio Delta Chapter of *Tau Beta Pi*, 1996-current.

Conference Co-Chair, First Annual Ohio Air Quality and Coal Research Symposium, Athens Ohio, December 2-3, 2004.

Conference Chairman, First Ohio Forum on Carbon Dioxide Reduction, Capture, and Sequestration, Delaware, Ohio, March 23, 2001.

Conference Chairman, Second Ohio Forum on Carbon Dioxide Reduction, Capture, and Sequestration, Lancaster, Ohio, April 26, 2002.

Conference Chairman, Ohio Mercury Control and Monitoring Forum, Columbus, Ohio, April 18, 2003.

Conference Chairman, Ohio Hydrogen from Coal Forum, Columbus, Ohio, April 2, 2004.

Session Chair for Electrostatic Precipitation, American Filtration and Separation Society Fall 2006 Conference, October 2006.

Professional engineering service to Facilities Management in evaluating technology for DOE/OCDO proposal for new power plant for Ohio University – 2004.

MATHCOUNTS volunteer, 1997-present

Mechanical Engineering Laboratory Curriculum Chair, 2002-2004.

Stewardship Campaign Chair, First United Methodist Church Athens, 2004-2006.

Upward Basketball coach [mostly 1st-4th graders] (2003-2011, 2013-current)

Usher Team Captain (Team 2), Christ Community Wesleyan Church (2011-2015)

Graduate Students Directed

1. Hua Liang, "*Viability of Stirling-based Combined Cycle Distributed Power Generation*," June 1998.
2. Abu Hossain, "*Combustion of Solid Fuel in a Fluidized Bed Combustor*," August 1998.
3. Ashikur Khan, "*Experimental Studies of the Homogenous Conversion of SO₂ to SO₃ via Natural Gas Reburning*," June 1999.
4. Jirasak Jewmaidang, "*Homogenous Formation of SO₃ in Gas Reburning for NO_x Control*," November 1999.
5. Srinivas Tanneers, "*Low Temperature Conversion of SO₂ to SO₃*," October 2000.
6. Brian Haynes, "*Membrane Based Electrostatic Precipitation*," March 2000.
7. Rajinder Bagga, "*Biological Sequestration of Carbon Dioxide*," June 2000.
8. Joe Cochran, "*Wet Membrane-Based Electrostatic Precipitation*," November 2000.
9. Vijayagopal Veluthen, "*Plasma Enhanced Mercury Capture in Wet Electrostatic Precipitators*," August 2003.
10. Vishal Pawar, "*Use of Laminar ESP for the Capture of Titanium Dioxide Particles*," August 2004.
11. Pavan Valavala, "*Tensile and Creep Behavior of Omniscil in Membrane Based Wet Electrostatic Precipitators*," March 2005 (defended April 27, 2004).
12. Jason Trembly, "*The Effect of Coal Syn Gas Containing Hydrogen Sulfide on the Operation of a Planar Solid Oxide Fuel Cell*," March 2005 (defended Dec. 9, 2004).
13. Ujjal Ghosh, "*One Dimensional Modeling of Planar Solid Oxide Fuel Cells*," March 2005 (defended December 8, 2004).
14. Siddhesh Karakejar, "*Capture of Mercury in Wet Electrostatic Precipitator using Titanium Dioxide Sorbent Particle Injection*," March 2005 (defended Sept. 1, 2004).
15. Ke Li, "*Experimental and Theoretical Study of Sub-Micron Aerosol Collection Efficiency by Laminar Wet-Membrane Electrostatic Precipitator*," February 2005.
16. Huzefa Bharmal, "*Performance Evaluation of Wet Metal Plate Electrostatic Precipitator*," September 2005.
17. Subramaniam Rajesh Iyer, "*Sustainable Photosynthetic Carbon Dioxide Mitigation*," November 2005.
18. Hardikumar Shah, "*Performance Evaluation of Wet Plate ESP for Sub-micron Particles*," September 2005.
19. Yan Liang, "*Mercury Precipitation Control by Aqueous Ozone in the Wet Scrubbing System*," November 2005.
20. Rahul Jadhav, "*Modeling of Steam Reformation of Coal with Solid Oxide Fuel Cell Model*," October 2005.
21. Amitayu Pal, "*Modeling Operation of a Synthetic Gas Powered Planar Solid Oxide Fuel Cell*," November 2005.
22. Varalakshmi Jayaram, "*Capture of Elemental Mercury in a Wet membrane Electrostatic Precipitator using Hydrochloric Acid as the Reagent Gas*," October 2005.
23. Gautam M. Deshmukh, "*Development of the Pilot Scale Photobioreactor: Unique Application of the Enhanced Practical Photosynthesis*," March 2005.
24. Syed Hussaini, "*Design and Development of Laminar Flow Wet Electrostatic Precipitator and Testing using Sulfuric Acid Aerosols*," January 2005.
25. Yataavelli Laxmi Narasimha Reddy, "*Capture of Soluble Mercury Using Membrane-Based Wet Electrostatic Precipitation*," May 2005.

26. Misak Avetysan, "Optimal Expansion Strategy for a Developing Power System under the Conditions of Market Economy and Environmental Constraint: Case of Armenia," July 2006.
27. Aparna Chambravalli, "Development of Methodology for Experimental Procedure to find Electrical Conductivity of Bi-Layer Anode Material," January 2007.
28. Jason Trembly, "Investigation Into The Effects Of Trace Coal Syngas Species on the Performance Of Solid Oxide Fuel Cell Anodes," May 2007.
29. Chalernsak Dasaard, "Parametric Study of CO₂ for Cyanobacteria Growth in Carbon Remediation Facility – II," May 2007.
30. Venkata Ramani Gidugu, "Parametric Study of Light Intensity on the Growth Rate of *Chroogloeocystis Siderophila* in a Photo-Bioreactor," October 2007.
31. Kalyan Ram Pedaprolu, "The Factors Effecting The Conversion Of SO₂ To SO₃ During Reburning For NO_x Control In Coal Fired Power Plants," January 2008
32. Sreerupa Basu, "A Quantitative Study of the Chlorine Atom Concentration in Plasma," February 2008.
33. Vinay Uddandam, "Computer Simulation of an Electrostatic Cyclonic Emissions Separator," June 2008
34. Matthew Cooper, "Energy Production from H₂S-Containing Coal Syngas via SOFCs Utilizing Lanthanum Strontium Vanadate Anodes," August 2008
35. Channa DeSilva, "Effect of Manufacturing Technique on Electrochemical Response of a Sulfur Tolerant Planar Solid Oxide Fuel Cell Anode," August 2008
36. Naveen Kunapareddy, "Proof-of-Concept Test for Separation Efficiency of an Electro-Cyclone", June 2009
37. Chaminda Perrera, "The Effects of Mercury on the Performance of Ni/YSZ Anode in a Planar Solid Oxide Fuel Cell," March 2010
38. Brian Kaufman "The Effect of Operational Voltage on a Solid Oxide Fuel Cell Operating on Coal Syngas Containing Trace Amounts of Phosphine," March 11, 2011
39. Adam Mielnicki, "CO₂ Mass Transfer in a Novel Photobioreactor," July 21, 2011
40. Shailendra Singh, "Methodology for Membrane Fabric Selection for Pilot-Bioreactor," August 12, 2011
41. Josh Hlebak, "Equilibrium Modeling, Design, Construction, and Validation Testing of a Pilot-Scale, USS Gasification Reactor", August 2011.
42. Jeremy Allen, "The Effect of Baffle Arrangements on Flow Uniformity in a Manifold for a Unique Solid Oxide Fuel Cell Stack Design," November 21, 2011
43. Tanvir Tanim, Modeling of a 5 kWe Solid Oxide Fuel Cell Based Auxiliary Power Unit Operating on JP-8 Fuel, December 12, 2011
44. Brian Kaseman, "An Investigation of Secondary Formation of High Temperature Solid Oxide Fuel Cells," February 20, 2012
45. Alex Lunka, "Effects of flashing light-emitting diodes in a membrane-based photobioreactor ," May 30, 2012
46. Fen Xin, "Mathematical Modeling of Ultra-Superheated Steam Gasification," Dec 6, 2012
47. Chaermsak Daasard, "A Transitional CO₂ Concentration for Thermophilic Cyanobacteria Growth in a Membrane-based Photobioreactor," July 2013
48. Jeremy Spivak, "Ultra-Superheated Steam Generation for Use in a Fluidized Bed Gasifier ," November 24, 2013
49. Supradeep Vijaya Kumar, "Measurement of CO₂ Mass Transfer Rate for Three Membrane Morphologies," March 5, 2014
50. Avinash Venkatagiri, "Materials and Methods for Algae Preconcentration," April 17, 2014

51. Alex Lunka, “*Development of a Novel Air-to-Liquid Mass Transfer Mechanism,*” November 4, 2014
52. Xiao Dong, “*Techno-Economic Analysis of a Cost-Effective Treatment of Flowback and Produced Waters via an Integrated Precipitative Supercritical Process,*” April 20, 2015.
53. Anoop Karisdappa, “*Study of Filtration Characteristics of Crossflow Filtration for Cable Suspended Robot - Algae Harvester,*” August 12, 2016.
54. Vikas Vishwanath Indushri, “*Development of a Catalytic System for Air-to-Liquid Mass Transfer Mechanism,*” November 12, 2016
55. Ahmad Abu Hajer, “*Enhancing an Air to Liquid Mass Transfer Unit,*” October 10, 2019
56. Mohammad Hatami, “*Multiscale Analysis of Mechanical and Transport Properties in Shale Gas Reservoirs,*” November 10, 2020
57. Shoghik Dilanyan, “*Algal Remediation of Hydrothermal Carbonization Process Liquid (HTC) of Food Waste,*” April 19, 2021