

EDUCATION

Biological Engineering, PhD, Advisor: Dr. Timothy Whitehead Enrolled August 2019

Department of Chemical & Biological Engineering
University of Colorado - Boulder | Boulder, Colorado

Work of note:

- Independent Studies under Dr. Jerome Fox & Dr. Timothy Whitehead
- Teaching Assistant for Senior Design – Chemical & Biological Engineering
- Biomolecular Kinetics, Transport, & Thermodynamics (CHEN 5150)
- Metabolic Engineer (CHEN 5803)

B.S. in Chemical Engineering with Honors, College of Engineering & Honors College May 2016

Michigan State University | East Lansing, Michigan

- GPA: 3.88 / 4.00
- Recipient of the Larian Gifford Memorial, West MI Engineering Alumni, and MI Competitive Scholarships

Coursework of Note – Honors and Graduate Level Courses

- EGR 102H: Introduction to Engineering Modeling
- BS 181H: Honors Cellular & Molecular Biology
- CHE 210: Modeling Analysis and Transport Phenomena (Honors by option)
- CHE 311: Fluid Flow and Heat Transfer (Honors by option)
- BMB 829: Methods of Macromolecule Analysis and Synthesis (Graduate Course)
- CHE 883: Multidisciplinary Bioprocessing Laboratory (Graduate Course)
- CHE 473: Polymers and Materials (Honors by option)
- CHE 483: Brewing and Distilled Beverages Technology (Honors by option)

High School Diploma, Byron Center High School | Byron Center, Michigan June 2012

- Graduated 9th out of 230 students with a GPA of 4.05 **AP Classes counted out of 4.0 + 1.0*
- Advanced Placement Coursework: Calculus AB, Chemistry, English Language, English Literature, Psychology
- Varsity Captain of Wrestling Team and Tennis Team; “Top Dawg” Awards in Science, Math, and Spanish

PROFESSIONAL EXPERIENCE

Process Engineer - Large Molecule Manufacturing and Site Services, Engineering June '16 – Aug '19
Evonik Industries | Lafayette, IN

- Responsible engineer for process related activities in Incineration Services, Environmental Controls and Large Molecule Manufacturing Departments.
- Implemented controlled process changes under cGMP guidelines using the Management of Change system.
- Authored and conducted several mass transfer experiments in production equipment scaled up from pilot lab data to support fermentation process improvements and characterize equipment capabilities.
- Presented poster on fermentation mass transfer work at SIMB-RAFT Conference.
- Employed JMP software to perform statistical analysis of fermentation production data.
- Presented fermentation production data to customer at monthly optimization team meeting.
- Developed monitoring tools using process data historian to generate key periodic metrics, predict operational issues, and evaluate process conditions for identifying and implementing changes.
- Characterized mixing efficiency / residence time of wastewater treatment plant using fluorescent dye test.
- Conducted solid and liquid waste stream review as Principal Facility Reviewer. Authored documentation to help future reviewers determine allowable weight limits for solid waste streams.
- Actively participated in large capital project as a process engineer and design reviewer to renovate and make additions to the wastewater treatment plant. Performed quality checking, reviewing and editing for flow diagrams, process and instrumentation drawings (P&ID), equipment specification and functional specification documents. Principal Engineer for authoring commissioning documents and executing start-up activities on new phosphorous reduction chemical feed system and anaerobic tank system.

Zachary Baumer

zachary.baumer@colorado.edu • 616.795.6920

- Successfully planned and executed Confirmatory Performance Testing following the Hazardous Waste Combustor MACT, for two different incinerators as the Principal Engineer and Project Manager.
- Implemented solutions to ergonomic issues by collaborating with operational and maintenance personnel.
- Evaluated cost savings proposals following principles of minimizing waste, improving efficiency, and material sourcing improvements amounting to greater than \$225,000 annually.
- Implemented cost savings amounting to greater than \$45,000 annually.
- Conducted event and deviation investigations utilizing personnel interviews, trending process data, Root Cause Analysis (RCA), and building fault trees.
- Supported over 24 interns across two summer as a technical mentor and the lead social coordinator.

API - Pharmaceutical Manufacturing Intern, Process Engineering May '15 - August '15
Albemarle Corporation | South Haven, MI

- Implemented controlled process change within company systems under cGMP guidelines.
- Identified heat exchanger efficiency improvements in several vacuum systems.
- Determined run times and developed scheduling tools for the drying and finishing area.
- Redesigned the cooling tower water treatment system with Utilities and Maintenance Department.
- Corrected, updated, and improved several Process and Instrumentation Diagrams and other paperwork.
- Communicated with pump and heat exchanger vendors for technical information and price quotes.
- Monitored and evaluated production operations to troubleshoot recurring equipment problems.

Undergraduate Researcher, Mechanical Engineering Nanotechnology Lab May '14 – May '15
College of Engineering, Michigan State University | East Lansing, MI

- Undergraduate Engineering Research Experience, mentored by Dr. Junghoon Yeom
- Fabricated an acrylic chamber to house an electrospinning setup with a high voltage power supply.
- Researched and prepared sol-gel mixtures of metal-oxides, including rare earth metal oxides.
- Manufactured nanofibers via electrospinning of various polymer and metal oxide compounds.
- Processed electrospun nanofibers in vacuum oven for drying and ceramic furnace for calcination.
- Characterized nanofibers using Light Microscopy, Scanning Electron Microscopy, X-ray Diffraction Crystallography, and Energy Dispersive X-ray Spectroscopy.
- Presented poster at Engineering Summer Undergraduate Research (EnSURE) Symposium.

CoRe Lead/Honors Mentor, Introduction to Engineering Design and Modeling August '13 – May '16
College of Engineering, Michigan State University | East Lansing, MI

- Aided in running the lab, assisted students with daily tasks, answered questions, and alleviated concerns.
- Managed other undergraduate mentors on various tasks. Conducted two safety-trainings per semester.
- Helped teach MATLAB and Excel as a modeling tool in EGR 102, also worked with the honors section.
- Held weekly meetings with the Course Instructor, Mr. Hinds, as Lead Mentor for EGR 100 (Design).
- Fabricated equipment to support class projects including a shelving unit and solar car testing setup.
- Cleaned, organized, and maintained stock of equipment and supplies in the machine shop weekly.

Farm Hand/Seasonal Worker, Kapteyn Farms | Byron Center, MI Summers: '10, '11, '12

- Executed various tasks including seeding, planting, picking, cleaning, packaging, watering, hoeing, and more.
- Supported on-site market through stocking, working the cash register, and interfacing with customers.

Technology Aid, Dr. Tim Tobolic's Byron Center Family Medicine Practice May '12 – August '12
Summer Internship | Byron Center, MI

- Learned about and abided by HIPA Act regulations.
- Employed MS Excel to compile, organize, and build spreadsheets for various patient demographics.
- Completed various office tasks including billing and accounting, mail sorting, scanning documents, etc.
- Updated procedures and information for billing insurance companies.

LEADERSHIP, MEMBERSHIPS, AND OUTREACH

President of Omega Chi Epsilon (OXE), the Chemical Engineering Honor Society, 2015-2016

Memberships: Honors College First Year Council (HC-FYC) and American Institute for Chemical Engineers (AIChE)

Volunteer, miscellaneous activities listed below

- Performed demonstrations and facilitated interactions with K-12 students at Impression 5 Art Museum for multiple Chemistry and Engineering Days with Tau Beta Pi and Omega Chi Epsilon.
- Helped at various MSU events including the Career Gallery Expos, a STEM Preview Day, and the Alumni Distinguished Scholarship Competition, which I was a previous participant. Additionally, I volunteered at the MSU Food Pantry.
- Participated in "Alumni & Friends" board discussions for the MSU College of Engineering.
- Attended various Best Buddies program events hosted for individuals with cognitive impairment.
- Assisted the Clothe-a-Child at work by participating in backpack stuffing, shopping, and bake sale donations.
- Performed outreach through science demonstrations for K-6 students with the Evonik Wizards.
- I was a tutor and mentor throughout high school with Northstar Academy and at MSU with OXE.

ADDITIONAL INFORMATION

General Skills: variety of laboratory work, multidisciplinary/interdisciplinary group work, computer literacy, research, technical writing, and cross-functional/disciplinary communication. Proficient with Microsoft Office software (Excel, Word, Outlook, Power Point), MatLab, JMP, and ASPEN. Knowledge of cGMP requirements, FDA regulations, continual improvement (5S), Design of Experiment methods (DoE), data generation, statistical analysis, and software used for document control and management of manufacturing processes.

Journal Reviews/Research Experience/Accomplishments/Presentations:

I am familiar with reviewing technical papers and performing journal reviews through my various research opportunities. I have also had the opportunity to explore various research fields and methods of research.

- Starting in my first year of college, the Honors Cellular and Molecular Biology course required reviewing and reporting on papers about emerging research in the broad field of biology, their technical merit and social relevance. Topics included prions and related diseases, the emergence of epigenetic research, therapeutic application of siRNA, diabetes and a case study of an emerging society, stem cell research and a discussion on benefits and ethics, understanding genetically modified organisms, retroviruses, and several other topics.
- As an undergraduate researcher under Professor Junghoon Yeom, I learned about electrospinning process and our application of interest. I researched how to synthesize sol-gel, fabricate an electrospinning apparatus, electrospin nanofibers, process the fibers through vacuum drying and sintering, and characterize the fibers through various microscopy techniques and other methods for characterization.
- In a one semester independent study under Professor Carl Lira, I researched how crude oil is currently characterized and modelled. We collaborated with University of Michigan graduate students working towards developing a model to predict the behavior of SARA compounds.
- In the Biochemical Engineering undergraduate course, and continuing in the Multidisciplinary Bioprocessing Laboratory graduate course taught by Professor Worden, I was able to do work on k_{La} determination and modelling. The work started in the undergraduate course with using a bubble column to quantify the k_{La} of a microbubble generator under various conditions. Continuing in the graduate course, I was able to perform additional k_{La} experiments and successfully test the feasibility of supporting a fermentation using microbubble sparging in lieu of a traditional submersed agitator.
- In the Honors Option for the Polymers and Materials course, I wrote a paper characterizing and identifying an "unidentified" polymer through various methods discussed in class. This provided hands on experience using DSC to determine glass temperature, crystallization temperature, melting temperature, and the associated heats with these various transitions. Additionally, I employed TGA to determine the water content, the thermal stability and degradation temperature of the polymer in question.

- In BMB 829: Methods of Macromolecule Analysis and Synthesis we learned about various lab equipment and methods for performing research in biology. Subjects discussed included microarrays and sequencing technologies, mass spectrometry (various topics), protein-protein and protein-nucleic acid interactions, cloning methods, confocal microscopy, flow cytometry, applications of NMR and molecular binding. The capstone project for the class was to develop a grant proposal for a theoretical case study in which we were to evaluate the pathology of a diseased plant.
- I have performed research, journal, and legal reviews for various other academic and industrial purposes regarding fermentation, incineration, wastewater treatment, and environmental regulations and compliance.
- I presented a poster at Recent Advances in Fermentation Technology Conference in 2017, hosted by the Society for Industrial Microbiology and Biotechnology. The poster was about agitation experiments performed in industrial fermenters (60 m³) to improve the mass transfer capabilities targeting the mass transfer coefficient $k_L a$. This work supported other process improvements with increased oxygen demands as well as demonstrated equipment capabilities. I was the principal engineer on these experiments and championed their execution. The experiments that were ran at production scale required collaboration with production schedulers, maintenance, operations, supporting scientists, engineering, and customers. Additionally, I attended the preceding workshop on advanced fermentation concepts as well as the entire conference.
Z. Baumer, K. Alsaker, S. Woodard, D. Hester and T. Rau, Evonik Corporation "Mass transfer improvements in industrial fermenters" Presented at RAFT Conference. Ft Meyers, FL. October 2017
- I presented a poster at the Engineering Summer Undergraduate Research Program (EnSURE). The content was on the process of electrospinning nanofibers, as well as fabricated and characterized fibers.
Z. Baumer, J. Yeom, "Electrospinning Mixed Metal-Oxide Nanofibers: Fabrication and Characterization" Presented at Michigan State University College of Engineering EnSURE Conference. East Lansing, MI. July 2014
- In my senior year of college, my brewing team at MSU won a Gold Medal in the inaugural US Open College Beer Championships. The Gold Medal was won in the Belgian category for a witbier named "Wittier than thou."
- In 2006, we won the Time Magazines Person of the Year.

Personal Statement and Professional Interests

I have great interest in biology and human health. This aligns well with my desire to help the global community. I would like to research the pathology of diseases to support the development of therapies and cures. I would like to research the mechanisms by which various proteins can be beneficial or detrimental to the health of an individual. I would like to research the epigenetic influences that may act on our genome so that we might exploit this for medical benefits. I want to join the vanguard and support the advancing fields responsible for the next breakthroughs in medicine. I believe this will afford me fulfillment in my life, something I yearn for.

I believe chemical engineers have the necessary background and prospective to be great researchers in the field of biology and health. Chemical engineers are trained to look at the big picture and critically analyze problems. One can draw many analogies between chemical processing systems and biological systems, which overlap in many regards. I believe I embody the traits of a chemical engineer that I describe.

While I have high aspirations, I maintain my humility. I realize that we are only here today because we stand on the shoulders of giants. Additionally, I understand the vanguard is not an individual, but a group of individuals and teams – one that I hope to be a part of one day.

I am a first generation college graduate, the son of two hard-working, blue-collar parents. They instilled in me a hard work ethic, a value in education, and a sense of humility. I enjoy volunteering and giving back to my community. I love to learn as well as to teach. I love the outdoors, travelling, and being generally active. I love biking, playing soccer, volleyball, disc golfing, hiking, and the gamut of board sports.