CHAIR’S MESSAGE
To fulfill our strategic plan and achieve our vision, we need the support of all the members of the community of the Department: students, alumni, industry and government, faculty, staff and friends.

WELCOME NEW MEMBERS

Matthew Stoops Appointed Faculty Specialist
Matthew Stoops, BS 1997 and MS 2015, both from Chemical and Paper Engineering Department at WMU, has been appointed faculty specialist in our department. Matthew has previously worked in our department as a lab supervisor and has had several years of experience in assisting instruction in undergraduate labs and pilot plants.

Jamie Long Appointed Department Office Assistant
Jamie comes to our department from Sindecuse Health Center. She has been with Western for three years now. She brings over 15 years experience in administrative work. Jamie has two daughters currently attending Western and a son in junior high. Her oldest daughter is in her third year and her other daughter is a dual enrolled high school senior who plans to enter the Chemical Engineering program next fall. Jamie enjoys working with the students at Western and helping them in any way she can.

Kyle Manninen Appointed Recruiter for Paper and Printing Program
Kyle earned undergraduate degrees in Marketing and Management from the Kelley School of Business at Indiana University in 2010. After graduating, he worked in retail management for several years. He earned his Master’s of Business Administration from Western Michigan University in 2015. Prior to joining our department he worked as Assistant Director of Professional Development Programs for the Global Business Center at WMU. In this position he worked closely with international students and created conferences and training programs to teach business skills.

New General Manager For Pilot Plants Appointed
A Western Michigan University alumnus and paper industry veteran, Lon E Pschigoda II, has been appointed to lead the University’s Paper, Coating, Printing and Recycling Pilot Plants. Lon E Pschigoda II was named general manager of WMU’s celebrated pilot plants in August. He replaces Joel Kendrick, who held that position for 12 years before his death in 2015. Pschigoda is a 1998 alumnus of WMU’s paper and printing science and engineering program. He has worked as a process engineer, product specialist, product manager and director of pricing and marketing with such firms as Crown Vantage, Graphic Packaging International, Sonoco’s Industrial Carriers Division and Tate and Lyle’s Bulk Ingredients Division.

The WMU Pilot Plants provide workforce and facility solutions for research, product development and education. The plants serve both the industry and educational communities within the paper, printing, and allied industries. Through public partnerships, the plants provide a valued workforce supplement as well as access to pilot plant facilities and personnel for industry research and trials.
Springstead’s Research On Immune Systems Published in “Science” Journal

Dr. James Springstead recently worked with Dr. Jon Kagan, an associate professor at Harvard University, and several other worldwide collaborators to determine the role of oxidized phospholipids in activation of immune response, and this work was recently published in the prominent journal “Science”. Dr. Springstead’s main projects focus on developing novel treatments and determining new measures for risk of heart disease. Through his studies he and his collaborators have determined that oxidized phospholipids play a prominent role in the development of heart disease.

In this new publication, Dr. Kagan and Dr. Springstead reported that these oxidized phospholipids (OxPAPC) also have the ability to “hyperactivate” the immune system, and these studies may lead to the development of new methods to create more effective vaccines. OxPAPC are oxidation by-products of phospholipids that are found in all cell membranes and other lipids in the human body. Specifically, it was demonstrated through this research that OxPAPC also acts as a damage associated molecular pattern (DAMP), hyperactivating sentinel-like cells called dendritic cells when paired with a second signal from microbes called a pathogen associated molecular pattern (PAMP) These dendritic cells, when activated by both a PAMP and a DAMP, strongly activate memory T-cells and hyperactivate the immune system. It was also demonstrated that the key protein which mediates this response is caspase 11.

These results are extremely important in the push to utilize the body’s own immune system in the fight to prevent disease. Dr. Springstead and Dr. Kagan hope that this work will lead to novel vaccines and other treatments in the near future. Dr. Springstead is continuing the partnership with Dr. Kagan and Dr. Ivan Zanoni, who recently joined Harvard University from Italy. More details about this work can be found from the following references:


Dr. Andro Mondala Awarded WMU Research Grant for Phosphorus Sustainability

Dr. Andro Mondala, Assistant Professor, was recently selected as one of the recipients of the Faculty Research and Creative Activities Award (FRACAA) by the WMU Office of the Vice President for Research. He received $9,992 in funds to conduct preliminary investigations to develop a novel bioprocessing system using fungi to extract phosphorus from runoff sediments, which are recognized as one of the main causes of freshwater eutrophication globally.

The purpose of FRACCA is to encourage and support faculty in significant research and to increase external funding in support of faculty scholarship.

Dr. Andrew Kline appointed Associate Dean for Research and Graduate Education

Dr. Andrew Kline, Professor in the WMU Department of Chemical and Paper Engineering, was appointed Associate Dean for Research and Graduate Education in the College of Engineering and Applied Sciences (CEAS) as of September 1, 2016. In this new role, he will be working across the college and the university with faculty and staff to expand quality research activities and continue to build on the success of the CEAS graduate programs, including increasing the preparedness of new graduate students to engage in research, and encouraging them to complete their degree programs in a timely fashion. He will continue to teach one course per semester. For the current 2016-17 academic year, that will entail his continued coordination of the senior capstone design experience for the chemical engineering students.

Dr. Kline earned his PhD in Chemical Engineering from Michigan Technological University in 1993, where he was then employed as a senior research engineer and instructor. After a post-doctoral
Dr. Andrew Kline continued

appointment at Cornell University, he joined WMU in 2001 and is now a tenured Professor. He has taught chemical engineering courses from freshman through graduate level, emphasizing senior capstone design, material and energy balances, and thermodynamics. He has also taught the introduction to engineering for freshmen within his discipline and for students across the College. He has been the faculty advisor for 95 capstone design teams and 33 senior honors theses since 2002, and has chaired or served on 12 graduate student thesis committees. He is currently a peer reviewer for the Higher Learning Commission.

Since 2003, Dr. Kline has been Principal Investigator (PI) on three federally funded engineering education grants totaling approximately $1.19 million, and other grant projects as Senior Personnel or Site Director exceeding $1.50 million. He has 17 peer-reviewed journal publications or book chapters; 25 peer-reviewed conference papers; over 40 research project reports to sponsoring agencies; and more than 90 presentations at various peer and non-peer reviewed conferences or university-wide symposia.

Dr. Kline’s research focus has been and will continue to be engineering education, and he has included incorporating service-learning into engineering design courses, STEM outreach to local K-8 students, and increasing undergraduate student retention and diversity. Since 2008, he has been the WMU Site Director for the Michigan Louis Stokes Alliance for Minority Participation (MI-LSAMP) Program. He is the faculty advisor for the WMU student chapters of the National Society of Black Engineers (NSBE); American Institute of Chemical Engineers (AIChE); and Society of Automotive Engineers (SAE) Baja car team. His grants have supported student attendance at conferences with 30 paper or poster presentations with students as first.

Dr. Kline has been a member of the American Society of Engineering Education (ASEE) since 2002 and a member of the Executive Board of the North Central Section (NCS) since 2008. He has been chair of the NCS regional conference best paper award process (2009-11); section Vice-Chair (2011-13); section Chair (2013-15); section Past Chair (2015-17); and an ASEE Zone II Best Paper Judge in 2010, 2011, and 2012. In November 2016, he will be on the national ASEE ballot for the position of Chair-elect for the Zone II region. The Zone II Chair-elect position is one of the four zone leaderships in the national ASEE organization. The position entails providing faculty and university input about the future priorities and directions of the ASEE national activities.

Dr. Said AbuBakr, One Of The Champions at AIChE Meeting

Dr. AbuBakr is an instructor of this year’s AIChE sponsored workshop: Jump Start Process Safety Engineering Education: A How-to Workshop. The workshop is part of the AIChE Undergraduate Process Safety Initiative and it is designed to give faculty the tools and information to incorporate process safety training into the ChE curriculum. Dr. AbuBakr’s presentation is titled: Lessons learned from teaching one credit process safety course with curriculum integration.

Dr. AbuBakr also chaired a session at the student conference on Engineers without Borders global engineering activities, and chaired another session called AIChE International House with invited papers from six different countries. Dr. AbuBakr presented a paper on global engineering student outcome assessment with Dr. Springstead as co-author.
PTF Awards $101,000 Scholarships To Undergraduate Students In Paper Engineering in Fall 2016

The Western Michigan University Paper Technology Foundation (PTF) was established to support students desiring a career in the pulp, paper and allied industries with scholarships. The PTF awarded $101,000 in scholarships to students for Fall 2016, and has awarded $4.5 million in scholarships over the last 30 years. These scholarships help our students offset the cost of tuition. The endowments held by PTF have been made possible by the generous donations from both paper engineering alumni and friends, and the paper industry, to attract and retain students in the paper engineering programs at Western Michigan University. Many paper engineering alumni have personally benefited from the PTF scholarships and a successful career in the industry. Therefore, they wish to give back to allow more students the opportunity to enter a rewarding industry.

All resources of the Paper Technology Foundation are dedicated to helping attract students and prepare them for contribution to the industry. Demand for paper engineers continues to remain high. The paper industry and allied companies make this very clear by annual participation and contributions in the way of money and equipment donations, mentoring, sponsorship of industry field trips, and by actively recruiting our students for employment starting freshman year. The level of support our students have received is remarkable and unique, and it is only made possible by the outstanding contributions of thousands of members of our WMU paper engineering family.

Eight chemical engineering students: Garrett Fisher, Ha Phan, Clarissa Stanton, Muhammad Siddiqui, Joshua Mussche, Brandon Gould, Myriah Kahlmorgan and Adam Fritz, have won 15th Armstrong Energy Management scholarships this year. The Armstrong scholarships are awarded to students pursuing the energy management option within the chemical engineering program at the College of Engineering and Applied Sciences. The awards are given to juniors and seniors each year by Armstrong International, a family-owned, multinational company that develops intelligent system solutions for steam, air and hot water. When the students were asked why they chose this education path, the general consensus was that they believe energy management and efficiency is an important concern for most business and industry globally.

Patrick Armstrong is the president and CEO of Armstrong International and one of the college’s 2011 Alumni Excellence Academy inductees. Armstrong International executives Tom Henry and Tom Hiatt attended the event and presented the awards to the students. Dr. Houssam Toutanji, Dean of the College, Dr. Kecheng Li, Chair of Chemical and Paper Engineering, Dr. Said AbuBakr, professor, and Dr. Andro Mondala, assistant professor, also were present at the awards reception in Fall 2016.
PhD Candidate, Ruoxi Ma, Receives Awards For Her Outstanding Works

PhD student Ruoxi Ma has been granted $8,158 from the Paper Technology Foundation (PTF) at Western Michigan University for her work on glucomannan/nanofibrilated cellulose coating in Summer I 2017, under the supervision of Dr. Alexandra Pekarovicova. The PTF Research and Education Committee reviewed Ma’s proposal and unanimously agreed to support the research. The funding is intended as seed funding for master’s and doctoral students studying in the area of Paper, Printing and Biomaterials. Board members felt Ma’s research, if directed to areas in food packaging, could potentially result in cereal cartons with this type of coating, thereby reducing total package material consumption.

Ruoxi Ma, under supervision of Dr. Alexandra Pekarovicova, was also awarded Gravure Education Foundation(GEF)/Flint Group award for technical writing in the rotogravure field in May 2016. The GEF/Flint group contest is an international competition for graduate and undergraduate students for technical writing in rotogravure. Ma’s paper was on gravure printability of glucomannan /nanofibrillated cellulose based biofilm.

PhD Candidate, Payam Aminayi, Receives Student Awards And PhD Degree

Payam Aminayi, a PhD student working under the guidance of Dr. Brian Young, received a $1,000 Graduate Student Research Grant earlier this year from the WMU Graduate College to support completion of his PhD related to the development and evaluation of matrix material formulations for potential integration into immunodiagnostic biosensors. Aminayi has successfully completed his thesis, “Development and Evaluation of Matrix Material Formulations for Potential Integration into Immunodiagnostic Biosensors,” and he has been awarded a PhD degree. Congratulations, Dr. Aminayi!

Master’s Student, Katie Gaviglio, Wins Regional Research Poster Competition

Congratulations to Ms. Katie Gaviglio, a recent BS Chemical Engineering graduate (2016), for winning first place in the Best Student Poster Award competition at the American Society for Engineering Education (ASEE) North Central Section regional conference. The conference was held at Central Michigan University in Mt. Pleasant, MI in March 2016. Katie presented her research on extracting phosphorus from runoff sediments using fungi under the direction of Dr. Andro Mondala, Assistant Professor at the Department of Chemical and Paper Engineering. Her project was funded in part through the Michigan Louis Stokes Alliance for Minority Participation (MI-LSAMP) program. Katie has just recently joined Dr. Mondala’s research group as a Masters’ student in chemical engineering beginning the Fall 2016 semester to continue her research project.

Undergraduate Student, Logan Hughey, Receives Research Award

Mr. Logan Hughey, a junior chemical engineering student, was recently selected as a recipient of the Undergraduate Research Excellence Award by the WMU Office of the Vice President for Research. He receives a $500 stipend and $200 for materials and supplies. He will conduct preliminary research on fungal-algal biofilm systems for sustainable phosphorus recovery from non-point pollution sources under the direction of Dr. Andro Mondala, Assistant Professor and Director of the Biosystems, Bioproducts, and Environmental Engineering Laboratory. Congratulations to Logan!

Logan Hughey preparing his microbial culture experiment set-up.
PROGRAM ADVISORY ACTIVITIES

Chemical Engineering
Industrial Advisory Board Fall Meeting
The meeting was held on Friday, October 14th in Elson Floyd Hall. Members from several industrial partners came to the meeting and brought with them expert views and recommendations on the future of our chemical engineering program at WMU. We discussed the ABET visit in Fall 2017; filling two faculty replacement positions by Fall 2017; ways to engage more alumni and expand the membership to include more industrial partners on the committee. We discussed particularly how we can carry out our plant design projects and design course with more industry involvement, and all members expressed their interests and support.
We decided that the next IAB meeting will be held during the Senior Design Project event on Tuesday, April 18, 2017. The IAB business meeting is at noon with lunch with seniors. Senior presentations are from 9 a.m.-noon and 1:30-4:30 p.m. All alumni are invited to attend and help us celebrate our Senior Design Project Day!
Dr. Kecheng Li, Chair of the Department, Dr. Said AbuBakr, Dr. Dewei Qi, Dr. Brian Young, and Dr. Andy Kline, Associate Dean, were present.

32nd Annual Gravure Day
The 32nd Annual Gravure Day at Western Michigan University was organized by Dr. Alexandra Pekarovicova and GPS 3590 Rotogravure class. We had a great turnout with multiple companies as well as participation of our undergraduate and graduate students in GPS program.
The first speaker was Walter Veil, president of the Gravure Education Foundation (GEF). The GEF, established in 1979, promotes and supports educational development in gravure technology. GEF gives many grants and scholarships to eight US schools with printing programs. Walter Veil has been a board member of the Foundation for 30 years.
Each year GEF distributes $15,000 in scholarships and another $15,000 in grants. In 2016, they handed out 11 scholarships, 3 of them to WMU. WMU graduate student Ruoxi Ma under supervision of Dr. Pekarovicova won a GEF/Flint Group technical writing contest cash award of $1,500.
This year, WMU also received a $5,000 grant from the GEF, submitted by Dr. Pekarovicova, to put towards the Graphic and Printing Science program.
Jeff Bergkamp, quality manager for St. Louis, Missouri branch of Schattdecor and a WMU graduate, also gave a speech. He explained the basics Schattdecor decorative business, and the value WMU students bring to the gravure industry.
Kalyee Flannery, also a WMU recent graduate, spoke about Quad Graphics, the large US gravure printer. Quad Graphics produces $4.7 billion in sales. They have 53 U.S. facilities located worldwide. Most of their U.S. facilities are in Wisconsin.
Lena Davie and Bill Hartman from OMNOVA spoke about their specialty finishing chemicals and décor gravure printing. Lena was interested in hiring some of the WMU students for their internship/co-op program and their Leadership Development Program that they just started. The company is composed of about 75% chemical and 25% décor printing. The entire company has only 1100 employees, making it easy to make an impact in the company as well as get to know your coworkers.
32nd Gravure Day was a great success. Students were able to mingle with industry, were offered multiple opportunities to further their education and careers, as well as interview for summer internship positions.
Congratulations to Charles Klass, a paper engineering graduate from WMU, who was recently inducted into the Paper Industry International Hall of Fame.

Charles (Chuck) Klass is a 1962 graduate of WMU’s paper engineering program. With more than five decades of pulp and paper and allied industry experience - including 30 years as a consultant and innovator in the field of coated paper, paperboard, tissue and other paper-based products – he has worked with companies all over the world. He holds eight US and international patents, and has published 164 technical papers including chapters in books and trade journals. He started his company, Klass Associates Inc., in 1986. Klass also holds a MBA from Pace University in New York City.

Klass’s contributions to the industry led to the commercialization of the metered size press, coating of deinked post-consumer recycled waste papers to improve grease resistance, the development of Crayola Color Wonder® paper, the development of rod coaters for Kohler Coating, the commercialization of nanoparticle biolatex binders for Ecosynthetix, and the development of ColorLok® technology for Hewlett Packard for its inkjet papers.

Klass is a member of the Paper Industry Management Association (PIMA), the Technical Association of Pulp and Paper Industry (TAPPI) and the Canadian Paper and Pulp Association (CPPA). Active in public service, he served as lieutenant and pilot with the New Jersey Civil Air Patrol, board member of Philadelphia’s American Cancer Society, and board member of Historic Rittenhouse Town, where the first paper on the continent was made in 1690.

For his contributions to the industry, Klass has received many honors including the TAPPI Gold Medal, TAPPI Fellow, TAPPI Paper and Board Manufacturing Division Award and Harris O. Ware Prize, TAPPI Distinguished Service Award, and TAPPI Coating and Graphic Arts Division Leadership and Service Award. He also is a fellow of WMU’s Paper Technology Foundation and received the Paper Technology Foundation’s Hall of Fame Award.

Klass and his wife Beverly live in Madeira Beach, Fl. They have four daughters, a son, eight grandchildren and two great-grandchildren.
Alumni Excellence Awards

Congratulations to Brianna Franks and Eric Thompson, two ChP alumni, who received the college wide excellence awards this year.

BRIANNA FRANKS, ’07, CHEMICAL ENGINEERING
As an undergrad, Brianna was an active member of the Society of Women Engineers, Tau Beta Pi, Alpha Lambda Delta, treasurer of AIChE, and a graduate of Lee Honors College. Brianna interned with Alticor (now Amway) during her sophomore year as well as with the Kellogg Company in her sophomore, junior and senior years. One month prior to graduation, Brianna was in a severe car accident. Bedridden, she finished her senior design project and final exams from home with the help of dedicated Western faculty.

ERIC THOMPSON, ’95, PAPER ENGINEERING
Eric Thompson is the lead IT Solution Architect for Manufacturing Systems at Kimberly-Clark Corporation. He is responsible for the overall design leadership of system implementations and integrating business, information, and technology architecture for Manufacturing Execution, Quality Management, and Product Life-cycle Management solutions corporate-wide at over 70 global manufacturing locations. He also provides functional and technical leadership to outsourced application service providers and internal IT team members to deliver system capability per changing business needs.

STUDENT ORGANIZATIONS AND ACTIVITIES

WMU Chapter Of AIChE

WMU’s chapter of American Institute of Chemical Engineers (AIChE) is up to many activities this year. Members meet on alternating Tuesdays and Thursdays every other week. The goals of AIChE is to expose students to resources that will help them grow at a collegiate level as well as help them transition into a career setting and create friendships that will last throughout college and career.

The WMU Chem-E-Car team has been designing a small chemical reaction driven vehicle which is intended to run a given distance while carrying a variable load of water. They are currently awaiting parts but will begin testing chemical reactions and building the car shortly. Although the process has been slow moving, the team is planning to compete in the Chem-E-Car competition in the coming spring semester where they will be pitted against familiar schools like Michigan Tech and the University of Michigan. This is a great step in the right direction for the student chapter of AIChE, as WMU has not been present at the competition in over a decade.

Another activity is AIChE nationals. Six members are going to San Francisco where they will discover more about the transition between collegiate life to career as well as many specialized lectures that are geared directly to chemical engineering majors. This conference will help the students become more worldly and get the chance to connect with many other students across the nation.

November 10th is also a fundraising event for the chapter. It is at the Panera located on West Main Street. The funding that will be collected will go to parts for the Chem-E Car as well as creating opportunities for students. Funds that are raised will also help the chapter travel to regionals where the Chem-E Car competition will be held.

The chapter is also doing a lot of work with lectures within the local community. Last meeting featured Dr. James Springstead where he spoke about an alternative to industry. He answered questions about what graduate school and research is like and what made him decide to pursue a PhD and Post-doctorate rather than going into industry.

The chapter is also organizing a talk with a Safety Process Engineer from Pfizer to speak among a variety of topics. The talk will range from life outside of college as well as finding what is the best career path. There will be enough time for questions and the chapter is very excited about this event on Tuesday, November 29. This talk will be very beneficial to students who are interested in going into industry after finishing college.

AIChE has also been committed to forming a community for chemical engineering students. Recently, the chapter held an ice cream social to relax and do homework together. Coming soon, the chapter has plans for “Secret Santa” and game nights which include chemical engineering trivia. The chapter aims to help underclassmen feel more comfortable in a very competitive major. This also breeds the opportunities for people to network with each other and talk about internships, co-ops, and future aspirations.
STUDENT ORGANIZATIONS AND ACTIVITIES

Ts’ai Lun

Ts’ai Lun is a student organization that is composed of students interested in pursuing a career in paper engineering. Throughout the year, students are connected to industry through experiences with field trips to industry sites, employer information nights, and conference trips to connect with other students in similar programs. These all provide insightful experiences that ensure that members are connected to industry and understand what is to be expected from entry level engineers. This allows for the students to make sure that they are in major that will allow them to have a career that they will enjoy. We provide a supportive environment for underclassmen in the program to learn and reach their potential, and strive to make everyone’s experience at Western a positive one.

If you are interested in the services and activities we have to offer, you can contact us at:
Lance McCauley, president of the WMU student organization Ts’ai Lun lance.mccauley@wmich.edu

Graphic Arts Society (GAS)

The Graphic Arts Society is an organization which focuses on a printing service for other RSOs and local business, networking with industry professionals and alumni, community service opportunities in Kalamazoo and social opportunities for members. The Graphic Arts Society got off to a hot start as the first half of the fall semester got busy with 3 different apparel orders. These include the NSSHLA (National Student Speech Language Hearing Association), the JDRF Run for the Cure Diabetes 5k and the Best Buddies RSO of WMU. GAS is now gearing up to do our special Christmas holiday party for the youth at the Kalamazoo Gospel Mission a little later in the semester.

The Graphic Arts Society has four primary purposes:

a] Providing a printing service to local and registered student organizations on Western Michigan University’s campus.

b] Providing a way for students to interact and network with alumni and other industry professionals

c] Providing various community service opportunities in the Kalamazoo community.

d] Providing social opportunities among members.

If you are interested in the services the Graphic Arts Society has to offer you can contact us at either:

connor.r.lengjel@wmich.edu
lois.lemon@wmich.edu

Paper Engineering Students Meet Industry Leaders

Paper engineering students on their visit to Maine.

After traveling 2,000 miles – with seven flights, six buses and one flight delay – WMU paper engineering students returned from Portland, Maine, where they recently attended a student summit held by TAPPI, the technical association of the pulp and paper industry. The 41 students had a whirlwind trip that involved hearing from notable speakers whose topics included leadership and the importance of personal branding and networking. They also had a chance to interview with leading companies in the industry.

The eventful weekend wrapped up with a trip to Somerset, Maine, to tour a 2,500-acre mill owned by pulp and paper company Sappi, and which housed three paper machines producing coated paper, grease-proof packaging and bleached chemical pulp.

“It was a great chance to hear from industry leaders,” said sophomore Rielle Walker “The information they shared really emphasized the need to develop strong interviewing, networking and communication skills with peers and potential employers.”

Lance McCauley, president of the WMU paper engineering student organization Ts’ai Lun, attended an invitation-only president’s luncheon held by Larry Montague, president and CEO of TAPPI. Senior Jake Marshall was part of a panel discussion on how to get the most out of summer internships and shared his work experiences with global chemical producer Kemira.

The largest number of Western students to attend this annual event, the participants also braved harsh weather and explored the city of Portland and attended a Portland Pirates professional hockey game.

Students also participated in an engineering competition that involved safely sending a raw egg down a ramp of increasing angles using only a piece of cardboard, sticky labels, tissues, a Dixie cup, a small Ziploc bag, and four wheels. With a lot of brainpower and a bit of luck, Western students Evan Ericson, Matthew Muhs and Nathan Rozegnal were a part of the winning engineering team.
STUDENT ORGANIZATIONS AND ACTIVITIES

Pfizer Manufacturing Plant Tour

On October 21, 2016, Dr. Young accompanied some 25 WMU undergraduate chemical engineering seniors and graduate students on a tour of Pfizer’s active pharmaceutical ingredient (API) manufacturing plant in Kalamazoo, Michigan. The students toured the main fermentation operations building, several downstream isolation buildings, and solvent recovery operations. This is the largest API manufacturing plant that Pfizer operates, with many buildings containing large scale process equipment that handle the processing steps for the numerous chemical intermediates and final APIs produced at this site. Our Pfizer chemical engineering and microbiology tour guides were very engaging and answered the students numerous technical and work related questions. The students were quite impressed and expressed how important such a trip was for bridging what they had learned in their coursework to the actual work place. Many hoped that one day they might have an opportunity to work for such a company and in such an environment. We greatly appreciate Pfizer’s interest and willingness to host such an event for our students.

Students Get Behind-The-Scenes Look At Paper Mills

Students from WMU’s paper engineering program visited two paper mills in September to get a close-up view of different mill operations and have a chance to meet with alumni and hear about their careers since joining the paper industry. First stop was the WestRock Mill in Eaton, Ind., where students toured the facility, learning about the delivery and sorting of bundled fibers arriving from recycling centers, the various grades of recycled fiber used, and the unwrapping and initial cleaning-out of debris -- such as bags, bottles, engines -- that material recycling centers failed to remove. They also saw the pulping of these fibers from various market pulp sources, wastewater treatment facilities that enable the plant to be totally enclosed and self-sufficient, and the forming, pressing, and drying operation from the multi-cylinder former to the dry-end winding and shipping.

Students then headed to Valparaiso, Ind., to visit Pratt Industries Mill – a mill that incorporates state-of-the-art recycling equipment and a dual fourdrinier forming section to produce a two-layer linerboard. The mill produces 400,000 tons per year, and is fully integrated with a corrugating operation that converts the finished product to boxes for customers and sheets of corrugated material that are printed and converted by others.

Students were enthusiastic about the visits and agreed the field trips are an invaluable part of the paper engineering program. “Being new to the program, it was a great opportunity to see the mills,” said sophomore Emily Schulte. “We saw one that was over a 100 years old as well as a start up, and made comparisons between the two.”

Freshman Ben Agay said he is looking forward to visiting other mills in the future. “This was the first time I'd actually been inside a paper mill and I absolutely loved it,” he said. “Going on this field trip allowed me to fall in love even more with paper engineering.”
Biosensor Research

The primary focus of this group, under the direction of Dr. Brian Young, is the development of simple biosensors using nanostructures. Biosensor research, development and commercialization in medical diagnostics, food quality control, environmental monitoring and national continue to receive significant attention. In contrast to most of the work on-going in this area, the aim is to develop a very low cost and simple immunodiagnostic assay platform technology that can be used throughout the world.

Current immunodiagnostic assays such as those that might be used on a blood sample taken in hospitals to detect a biomarker for heart attack or cancer, for example, can be quite expensive and can’t be done in areas of the world where facilities do not have the electrical services and environmental controls necessary for storing the reagents and maintaining the complex equipment that are used to process and run an assay. So to be able to overcome these obstacles, one must move away from liquid reagents to a dry, environmentally stable format placed on a low-tech substrate. Additionally, one must simplify and miniaturize the assay instrument and calibration, such as would be amenable to a hand-held device with a multi-assay chip format. To accomplish this is difficult, since each quantitative assay would have to be comparable in sensitivity, precision, selectivity and dynamic range to the current large instrument on-market assay technology.

Dr. Young has and continues to mentor graduate, undergraduate and high school students to conduct technically complex research on studying and further developing this very challenging immuno-biosensor concept. Additionally Dr. Young’s laboratory will be embarking on a second line of research in enzyme-embedded paper and paper additives to enhance paper and paper additive recyclability. This project will move forward in the next year pending approval of a DOE grant application next spring.

Nick Muller (MS student-left), Ryan Winkles (undergrad-right) and Dr. Brian Young (center) are brainstorming different approaches to experimental design to overcome device performance risks related to Nick’s thesis project, “Development and Evaluation of a Paper Bio-Nanocomposite Electronic Sensor Design for Immunodiagnostic Assays”.

Paulina Yu (undergrad) and Alex Maldonado (undergrad) are carrying out an experiment to help address a research question related to the immunodiagnostic biosensor projects in Dr. Young’s laboratory.
RESEARCH ACTIVITIES

Biosystems, Bioproducts, and Environmental Engineering Research

Under the direction of Dr. Andro Mondala, the research group aims to explore and harness chemical, biological, and environmental sciences and engineering principles to develop sustainable “green” technologies for the recycling and recovery of materials from wastes and environmental streams for beneficial reuse and environmental protection. The focus of the research group includes engineering efficient, economical, and environmentally-benign bio-chemical processes for simultaneously achieving waste valorization to value-added products and environmental remediation goals. Currently the research group is working on: (1) Extraction and recovery of phosphorus from nonpoint runoff and erosion particulates using microbial bioprocessing; (2) Direct biomass conversion to biofuels and chemicals using fungal co-culture hybrid solid-state/submerged bioprocessing methods; (3) Recycling and reprocessing of paper-based printed electronics and recovery and reuse of metallic inks; and (4) Valorization of papermaking and paper recycling residuals (e.g., sludge) to new value-added materials.

Shaun Shields, MS Chemical Engineering student, preparing his samples to run in the High Performance Liquid Chromatograph (HPLC).

Current members of the Mondala Research Group (Fall 2016). From L-R: Logan Hughey (Junior CHEG Student), Savannah McDowell (KAMSC High School Student), Katie Gaviglio (MS CHEG), Lei Zhou (MS CHEG), Jerico Alcantara (PhD Engineering and Applied Sciences), Shaun Shields (MS CHEG), and Dr. Andro Mondala (Lab Director).

Katie Gaviglio (L), MS Chemical Engineering student, working with Savannah McDowell, a high school student from the Kalamazoo Area Mathematics and Science Center (KAMSC).
High Performance Computational Research

Three PhD students, Tai-Hsien Wu, Ye Luo and Yihsin Tang, are working on numerical simulations of dynamic behavior of deformable solid particles in moderate Reynolds number fluids under the supervision of Dr. Dewei Qi.

Tai-Hsien (Bruce) Wu mainly focuses on investigating migration and segregation of bio-cells (red blood cells or cancer cells) in blood flows. He has developed a GPU CUDA 3D code which allows us to use 2,880 cores simultaneously for parallel computations.

Ye Luo is working on understanding the effect of rigidity and inertia of swimming bodies on their forward and back cruising motion. He has finished a GPU CUDA 2D code.

Yihsin Tang is conducting simulations of the paper forming and wet press at fiber levels. They recently attended the 25th International Conference on Discrete Simulation of Fluid Dynamics in Shen Zhen, China, and presented their work at the conference:

1] Tai-Hsien Wu, Mohammadreza Khani, Lina Sawalha, James Springstead, Dewei Qi “To implement a lattice-Boltzmann Lattice-spring method by using CUDA”, 25th International Conference on Discrete Simulation of Fluid Dynamics, Shen Zhen, China, July 4-8, 2016

These works are being prepared for journal publication as well.

Green Technologies for Biomass Processing and Advanced Nano-biomaterials

Under the direction of Dr. Kecheng Li, the research group aims to develop green industrial technologies for biomass processing to reduce energy consumption and its environmental impact, and develop advanced applications of nanocellulose materials in products such as batteries, supercapacitors, flexible display, and solar cells.

Master’s student Tiffany Zhou working on enzymatic pretreatment of wood fibres for cellulose nanofibres production.
Under the direction of Dr. James Springstead, the Laboratory of Medical and Biomolecular Engineering is focused on the role of oxidized lipids in chronic inflammation, specifically related to heart disease. Dr. Springstead works with collaborators worldwide, spanning from WMU, Harvard University, University of Kentucky, and University of Virginia in the U.S. to France and China. Recently he worked with Jon Kagan and Ivan Zanoni of Harvard University to elucidate the role of oxidized phospholipids in innate immunity, and he is also continuing this collaboration to determine the role and mechanism by which oxidized lipids affect metabolism.

In this lab, Abbie Brackman is a MS student in Chemical Engineering, and her research is focused on determining the mechanism by which oxidized phospholipids affect chronic inflammation in endothelial cells. She is planning to graduate this spring. Gabby Cole, a fellow MS Chemical Engineering student, works closely with Abbie, but her research is focused on determining...
the mechanism of how several oxidized fatty acids affect chronic inflammation, including isoprostanes, neuroprostanes, and neurofurans with collaborator Jean-Marie Galano in France. Several aspects of this research, which is funded by the National Institutes of Health (NIH), will be continued by Cody Fridley, who will be starting his MS in Chemical Engineering, and Piao Jian Tan, who has already finished his MS with Dr. Springstead, and who will be beginning his PhD studies. Cody also has been performing research that will hopefully lead to new diagnostic methods for early detection of heart disease.

Dr. Springstead’s lab also focuses on the involvement of a diverse set of students, including several students in chemical engineering, as well as people like Lizzy Ketchum, a current student in WMU Biomedical Sciences, who is planning on continuing her research as a PhD student, and Tyler Gardner, who is a current medical student in WMed.
RESEARCH ACTIVITIES

Nanoparticles and Nanomaterials Research

Under the direction of Dr. Kalyana Pingali, the research activities of this group cover the following areas: aerosol production of nanoparticles, crystal growth, nanoparticle synthesis of bimetallic and core-and-shell nanoparticles, carbon thin films, carbon supported nanoparticles, functional nanomaterials and advanced devices, pharmaceutical formulations, droplet dynamics, shear and electrostatic effects of micronized powders, microstructure investigation through structure performance evaluations, particle dynamics, powder flow and drug release.

In an effort to build a strong research program that lasts beyond 15-20 years, Dr. Pingali is currently working as a Principal Investigator towards creating and developing a multi-university-industry research center involving 10-12 industries and 4-6 national and international institutions, with WMU as the Lead Institution. The center is named ‘Center for Advanced Pharmaceutical Nanotechnology and Experimental Therapeutics (CAPNET).’ The program will focus on Nanoparticle Engineering for Multi-Scale Pharmaceutical Process Systems (NEMPS). As part of this effort, active research collaborations are established in USA with Rutgers University, Illinois Institute of Technology, University of Chicago, Northwestern University and University of Puerto Rico, and Argonne National Laboratory. Collaboration with international institutions include Kyoto University (Japan), National University of Singapore (Singapore) and Indian Institute of Science (IISc). In addition, participation of local high school K-12 students was also established with Kalamazoo Area Mathematics and Science Center (KAMSC). Underrepresented groups’ participation (particularly African-American high school students) was established through the active engagement of MI GEAR-UP and UPWARD BOUND programs. So far, this research group has produced 22 research grant proposals in the field of Pharmaceutical Nanotechnology which were submitted to various funding agencies.

Dr. Pingali is the first author of 25 peer reviewed research journal publications and 70+ conference presentations. Dr. Pingali’s graduate and undergraduate students have continuously contributed to various scientific research journal articles. As per Elsiever, one of Dr. Pingali’s latest research articles was downloaded or viewed 530 times. Another article was downloaded 69 times.

International collaborative program on NEMPS with students of National University of Singapore (NUS)

Dr. Pingali’s laboratory consists of powder flow measuring device to measure granular rheology, tapping density meter to measure the compactness and porosity of various powders and pharmaceutical formulations, mixing device consisting of a v-blender with intensifier bar to prepare formulations running at various shear parameters, scaling of nanopowder coatings with shear intensity, continuous rotary automated tablet press which makes tablets at a rate of 800 tablets per minute thereby investigating the microstructure of tablets, compressibility, blend and drug uniformity, drug manufacture and development. The lab is equipped with most of pharmaceutical unit operations, powder technology and analytical instruments. The lab is capable of handling powder rheology, tablet compaction, electrostatics of powder flow, drug dissolution and pharmaceutical formulations.
Continuous tone images are those that contain shades of gray and subtle variations in tone. This includes many types of artwork and virtually all photographs. One can think that a continuous tone image would require higher resolution in order to capture the subtle variations in tone. However, continuous tone images generally lack the hard edges and high contrast of line art, so there is no need for high resolution to create crisp edges. Instead, continuous tone images require only enough resolution to create a decent halftone. Printers usually want to create continuous tone images with a pixel resolution (PPI) that is twice the halftone line screen (LPI) that will be used in printing the final image.

The dot quality is well defined in the high DPI samples, as the resolution grows the micro dots to create the image are higher so the sharpness and quality is very high. The line qualities are well defined in the high DPI samples, the low DPI samples lines are very crooked in the edges. The DPI influences the number of gray levels produced in the print sample. A low DPI sample has got fewer number of colors produced (Gamut) in the printed sample. The text quality is also affected in the normal and reverse text. The reverse text in the lower DPI is affected in the print samples. The overall image quality and sharpness in the high DPI sample can be produced well whereas the low DPI sample has lost the quality, sharpness and fewer number of colors. The DPI should be decided based on the print quality requirement and substrate used for printing, as the higher DPI tends to take more time in processing and even more ink consumption in printing.

James Atkinson, a PhD student under the supervision of Dr. Margaret Joyce and Dr. Andro Mondala, is working on recycling of printed electronics materials. Research is being conducted to understand the impact that the recycling and disposal of printed electronic materials could have on the environment. Testing has been done to assess the partitioning of silver and nickel when paper containing conductive ink is re-pulped and then screened to calculate a material balance around the screening process. An abstract on the research has been submitted to Papercon for presentation to the Recycled Paperboard Technical Association in April 2017. Testing was conducted to determine the amount of silver and nickel that could leach into the environment if the printed electronic materials are landfilled, and the paper is in the process of being accepted for publication.
RESEARCH ACTIVITIES

A study using a scanning electron microscope was also carried out to qualitatively analyze the adhesion characteristics of the conductive inks on paper. This study was carried out at the Electron Microbeam Analytical Laboratory (EMAL) at the University of Michigan. This publication will be submitted to Cellulose or TAPPI Journal by the end of the semester. All of this research hopefully will lead to industry recognition and the possibility of WMU becoming an environmental testing site for the printed electronics industry for inks and substrates.

Michael Joyce, under the supervision of Dr. Dan Fleming, completed research characterizing polydimethylsiloxane (PDMS or Silicone) as a substrate for printed electronics. Silicone has a very low surface energy, which makes it difficult to print on. However, its biocompatibility makes it desirable for printed wearable sensors. Michael explored different treatment methods for raising the surface energy of silicone, including “piranha solution” UV/Ozone and plasma. This work has produced 3 journal papers and 1 patent.

Jae Shin, another PhD student under the supervision of Dr. Fleming, explored different paper coatings for different printing processes. His work on sustainable Biolatex based coatings has led to 2 peer review conference papers in the coating division of TAPPI. His work characterizing the particle size distribution of the Biolatex and evaluating new binders for inkjet coatings has resulted in 2 journal papers in preparation.

Dr. Fleming’s current PhD student, Awadhoot Shendye, has proposed a new spectrophotometric method for characterizing optical density and dot area for printed spot colors. Conventional methods only work for the printing process colors of cyan, magenta, yellow and black. Shendye’s new method allows for measuring density for any color, including extended gamut colors and spot colors. This is very important for packaging and direct mail printing where corporate color matches are crucial to protecting a company’s brand. A patent disclosure has been drafted and a Technical Development Grant has been requested to perfect this new technology.

Dr. Fleming and graduate students in the paper and printing programs are finalizing a new method of estimating surface energy of solids. This method utilizes the classic equation introduced by Girifalco and Good along with thermodynamic analysis, to put strict bounds on the free energy of a surface. A paper presenting the derivation of the method along with experimental verification is in preparation, along with 2 other papers utilizing the method to analyze special substrates for printing.

Students in GPS 3500, Offset Lithography that is instructed by Lois Lemon, are getting their hands on ink as well. They are making specific PMS (Pantone Matching Colors) for their Presswork Project, which was a two-color Perpetual Calendar printed on the Shinohara Press in the Print Laboratory in Floyd Hall.
Paper technology with the potential to provide clean drinking water to millions at a cost of just pennies a day has been successfully produced on a pilot scale at Western Michigan University this fall and may be on its way to becoming an international tool to prevent disease.

Paper filtering technology developed in research labs at McGill and Carnegie Mellon universities and the University of Virginia was brought to WMU this fall by Folia Water of Pittsburgh to test the feasibility of scaling the technology to major production. The technology is based on centuries-old knowledge about the antimicrobial properties of silver, and it involves the production of paper with silver nanoparticles embedded in it. The paper will be packaged in “Safe Water Books,” with instructions in the local language. Each page of the Safe Water book is a water filter capable of killing the viruses and bacteria in the water that passes through it.

The trial run in WMU’s celebrated paper pilot plants was successful, and the paper rolls produced are being converted into books and being readied for distribution.

“Those rolls are already sold, and we’ll be shipping books as soon as they are converted,” says Dr. Cantwell Carson, Folia’s chief technical officer, who attended the WMU trials. “The WMU paper plant has played a critical role in the development of our company and our technology.”

That technology, Cantwell notes, could provide clean and safe water to the 1.8 billion people worldwide whose water is contaminated by fecal coliform bacteria and other diseases. A page from a Folia book can clean up to 100 liters of water at a cost of less than a penny per day with no heat or electricity or need for a pump. The filters are recyclable and biodegradable.

Since 2013, the technology behind the Folia Filters have been tested in South Africa, Ghana, Honduras, Bangladesh, Kenya and Haiti, showing repeatedly that they can clean even the most polluted water and eliminating over 99 percent of bacteria. Each filter “page,” can last for weeks and each “book” could last for about a year.

The Folia Filter technology was originally developed by Dr. Theresa Dankovich during her doctoral research at McGill University. She continued work on the concept during her postdoctoral work at the University of Virginia and Carnegie Mellon. Now one of the co-founders of Folia Water with Cantwell Carson and Dr. Jonathan Levine, she serves as its chairwoman and chief scientist.

Dankovich says she originally set out to develop a product to help clean the environment, but quickly realized how important the tool would be to provide safe water supplies.

“I hope that these filters will one day help improve the health of millions of people around the world,” she told the Washington Post in 2015.

WMU Pilot Plants Manager Lon E Pschigoda says his facility’s role in the development of the filters was made possible by the caliber of its equipment and the technical expertise of its staff. This fall’s trial involved several attempts to embed the silver using different plant techniques.

“By utilizing our pilot paper machine, Folia was able to combine several steps in the production process into one continuous process,” Pschigoda says. “The flexibility of the equipment and the ingenuity of the operators at our pilot plant helped this trial become a success.”