

ChE News

FALL 2016

COLLEGE OF ENGINEERING



UNIVERSITY OF MICHIGAN

CHEMICAL ENGINEERING



Tony Lembke invests in our future

Mark Burns was recently appointed the Anthony C. Lembke Department Chair of Chemical Engineering

Anthony “Tony” Lembke (BSE ’80) might not want to admit it now, but he was once a fervent Notre Dame football fan, having been born in South Bend and growing up mostly in Indiana. However, that allegiance disappeared the day he set foot in Ann Arbor. After his family moved to Marshall, MI in his sophomore year of high school, Tony focused on the University of Michigan, both for academic excellence and the relative affordability of an in-state school. His family’s financial assistance was limited to just the first two years of Tony’s college education. Consequently, the balance would have to be earned, borrowed, or gained through scholarships. So Tony worked in the Law School’s cafeteria for three years, and found summer jobs at Eaton Corporation and Procter & Gamble.

Despite his efforts, he needed additional funds to complete his degree and sought assistance from the University. After a surprisingly short meeting with a College of Engineering staff member at the Chrysler Center, he was approved for an engineering scholarship. This financial support made a deep impact on Tony. He decided then that he would help other engineering students in need should that opportunity ever arise. As a result, his first gift to the College was a need-based scholarship, the Anthony C. Lembke Endowed Scholarship. He later funded the Anthony C. Lembke Student Global Experience Fund, which gives students an opportunity to go abroad. Every year, he enjoys hearing from recipients of his scholarships about their personal

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Note From the Chair

Mark A. Burns
 Anthony C. Lembke Department
 Chair of Chemical Engineering
 and T.C. Chang Professor of
 Engineering

Welcome to the 2016 Michigan Chemical Engineering Department Newsletter! As always, this issue is full of interesting stories, highlights, and awards.

As you read in the cover article, our department now has an endowed chair for the department head. Alumnus Tony Lembke (BSE '80) was extremely generous in endowing the Anthony C. Lembke Department Chair of Chemical Engineering. The gift provides discretionary money for the Department to carry out our mission. The funds will help significantly in educating our students and retaining our world-class faculty.

We also thank Frank Pavlis (MS '39) for the substantial gift he gave us this year that we will be able to use in multiple ways to improve the teaching and research in the Department. Make sure you read the noteworthy story of his education and his career at Air Products, which began with the establishment of the company.

On a more somber note, we were saddened by the loss of three of our colleagues Jack Powers, Dale Briggs, and Stuart Churchill this year. They all had a remarkable impact on our program, and it is hard to believe they are no longer with us.

Turning to faculty, we have two new additions this year. Andrej Lenert started at the beginning of September and works in the area of transport in nanostructured materials. Heather Mayes will start in January and her research focuses on multiscale modeling of biological molecules. Both bring energy and enthusiasm to our already excellent faculty. I was thinking of asking Professor Lenert to change his last name to "Blue" so that I could say we hired Mayes and Blue this year, but I think that would be going too far!

We also have a new Dean this year: Alec Gallimore. Dean Gallimore is an energetic and innovative leader. He began his term in July, and has already made changes to how the College and administrative services operate on campus. Having worked with Alec closely on the development of the MCubed research program, I know that he is a deep and careful thinker who will help the Department and College move forward. We have already started talking about an old topic—a new building for ChE! Hopefully we'll make some progress on that front in the coming year.

Our students continue to excel and exceed all expectations. For example, the AIChE Student Chapter, with Scott Fogler as advisor, has won an outstanding chapter award for the 7th year in a row! And Lola Eniola-Adefeso, graduate chair, and the graduate students started a phenomenal peer-mentoring program that is receiving rave reviews! These and other achievements are extraordinary and help make this Department a special place.

This will be my last year as chair. I had planned on being chair for only eight years, but with the start of new leadership at the College this year, I delayed one year to allow for a smoother transition. I have enjoyed leading the department for what will be nine years, but I am looking forward to doing more teaching and research in the future.

Enjoy the newsletter and have a great year! Go Blue!

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Frank Pavlis says thanks for his education

He took a gamble after he received his master's at Michigan and hired on as the first employee at Air Products

Frank Pavlis (MS '39) says he feels fortunate to have graduated from outstanding universities and wants to show his appreciation for the education he received. He says he decided that he wanted to make his gifts to his alma maters while he is living. Frank's recent substantial gift to our department will be used for a variety of programs, including fellowships and scholarships for students.

Higher education seemed a long shot when Frank was born on a small farm near Traverse City, Michigan in 1916, before the United States entered WWI. He had to leave home to attend high school in Traverse City. There, he did well in his chemistry, math, and physics courses and won a four-year scholarship to Michigan Tech in Houghton and started working on a chemical engineering degree in 1934. Frank's parents were burdened with debts on the farm and could not contribute to his college expenses. Hence, he had few funds available for food and personal expenses and worked for three of his



four undergraduate years. He knew that education was important if he wanted to succeed in life, so he accepted the struggle.

He graduated first in his 1938 class at Michigan Tech and received a fellowship to come to the University of Michigan. He spent a year in Ann Arbor working on his master's degree and remembers taking thermodynamics classes with Professor George Granger Brown and petroleum classes with Professor Donald Katz.

After he graduated in 1939, he was offered a job at Shell Oil Company in Tulsa, Oklahoma, which would have been a safe choice for his career. Instead, he decided to take a job in Detroit offered by an entrepreneur named Leonard Pool to design and hand construct a process plant to produce 99.5% oxygen gas from atmospheric air. It was a challenging project for a schoolboy! After the project was completed a year later, Frank, Pool, and two others decided to found a new company to manufacture and sell or lease air separation plants to large users of oxygen, nitrogen, and other gases in the air. On October 1, 1940, a new company named Air Products Incorporated was founded in Detroit. Frank, its first employee, was named chief engineer.

Business was slow at first but picked up when WWII began. The military needed lots of oxygen for high altitude aviation. In the early 1940s, there were many other businesses in the Detroit area that were crucial to the war effort and Detroit was becoming a crowded city. So the government decided to move Frank and Air Products south to Chattanooga, TN for the duration of the war. Of course, when the war ended in 1945, the contracts were cancelled, Air Products' profits tanked, and the work force was reduced to 15 key employees. It was decided to move the company from Chattanooga to a better business location.

After an extensive search, from St. Louis east to the Atlantic Ocean, a site was selected in the Lehigh Valley of eastern Pennsylvania. Their new home was close to the New York seaports and the federal government in Washington, D.C. Today, Air Products and Chemicals, Inc., the current company name, has annual revenues on the order of \$10 billion and operations in dozens of countries.

In 1947, Frank married Ethel Pohl, an Air Products employee, who died in 2002 after a long illness. He retired from Air Products in 1980 after 40 years of service. Successively in time, his positions included chief engineer, treasurer, technical sales manager, vice president of finance and vice president of international/world trade. He also served on the board of directors for 28 years. He has travelled around the world five times to date.

Frank is living in a senior home in Allentown, PA these days; he will turn 100 on October 29 of this year. He says it is getting more difficult to walk, see, and hear but he is blessed with a great memory and with his generous and positive outlook on life. We are sure he will continue to enjoy his days.

Tony Lembke

CONTINUED FROM PAGE 1

experiences at Michigan, what they are studying, and their dreams for the future.

When he recalls his days as a student, he remembers the genuine camaraderie among the chemical engineering students. He began in LS&A as a pre-med but was turned off by the competitive environment among the pre-med students. “It seemed to be a zero-sum game mentality: Your success might prevent my success so I’m not going to help you,” he remembers. “In chemical engineering, it was certainly competitive, but we believed we could all succeed so we supported each other.”

Although he spent only the first five years of his career as a chemical engineer, he began to explore how he could best support the Department in return for its tremendous influence on his own work ethic and self confidence. As Tony puts it, the lasting outcome from his time in Michigan’s Chemical Engineering Department wasn’t what he learned about chemical engineering, but what he learned about himself. He discovered “a higher gear” that he never knew existed that he would use repeatedly during the next 35 years of his professional life.

A seminal moment came in Scott Fogler’s reaction engineering course. Tony’s academic performance during his first two years was pretty mediocre; so his confidence was low as he entered his junior year. After the first exam, Professor Fogler wrote the names of the three students who received the highest grades on the blackboard. Tony hadn’t done that well on the exam, but something in that moment inspired him and he committed to himself that his name was going to be on the board after the next exam. He studied more thoroughly and intensely than before and was rewarded after the next exam when his name did indeed appear on the blackboard. After that, he could sense himself using that “higher gear;” his GPA rose, as did his confidence.

He worked at Exxon for five years after graduation but was an average engineer at best. He lacked the patience to work on a project for many months, only to find out that the proposed facility wasn’t economic

or that the company had decided to go in a different direction. He wanted faster feedback—the real-time feedback that the capital markets provide—and that led him to Wall Street. His first job was at an investment bank, Kidder, Peabody, in mortgage-backed securities, a young but burgeoning market in 1986. This market niche was especially attractive to an engineer, because valuation methods were numerically intensive and involved statistical modeling. He eventually

“He [Tony] clearly values his Michigan education and his generous gift will allow us to better educate the next generation of leaders.”

moved on to Salomon Brothers and then joined Salomon colleagues at their hedge fund firm, MKP Capital Management, in 1998, where he eventually served as a principal and co-chief investment officer before retiring at the end of 2014.

Since graduation, Tony has almost always made it back to Ann Arbor for at least one game every season. However, his visits increased over the past decade as his oldest son attended and then graduated from Michigan, before settling in Detroit.

Tony has always enjoyed Ann Arbor, with the many restaurants and bars and the attractive downtown and campus areas. More recently, he has been coming back to attend the Fall and Spring Engineering Advisory Board meetings as well as the November Engineering Scholarship Luncheon, where he gets to meet the new recipients of his scholarship.

After hearing from ChE chair Mark Burns how intensely competitive it is for the department to attract and retain world-class faculty, Tony concluded this was an area where he could give back with a “high return on investment.” He is directing his gift to Mark and future chairs so that they will have the discretion to use the money to bring in world-class faculty from anywhere around the globe.

Mark Burns describes Tony as a “classic example of a successful Michigan engineer; he’s someone who is willing to put in the time to excel in life but wants to help others succeed also, and to give back to the communities of which he is a member. He clearly values his Michigan education, and his generous gift to the department will allow us to better educate the next generation of leaders.” Mark adds that, “As we strive for excellence, it is often hard to predict new obstacles and to act promptly to make changes. Discretionary gifts like Tony’s will let us respond more quickly to find solutions for the challenges at hand.”



Tony and Mark Burns at the Endowed Department Chair Installation Ceremony in the Johnson Rooms at the Lurie Engineering Center on September 16, 2016. The Robert J. Vlasic Dean of Engineering Alec Gallimore was the host and both Tony and Mark made remarks at the event.

Welcome to New Faculty

Andrej Lenert joined the faculty in September 2016 and Heather Mayes arrives in January 2017



We welcomed Andrej Lenert to the Department of Chemical Engineering this fall as an assistant professor. Lenert completed his PhD in 2014 at MIT, where he worked with Professor Evelyn Wang. Most recently worked as a postdoctoral researcher at the University of Michigan with professors Pramod Reddy and Edgar Meyhofer at the Nanoscale Transport Lab, and at the Center for Photonic and Multiscale Nanomaterials, C-PHOM. He completed his undergraduate studies at the University of Iowa.

Lenert's research focus is on the understanding and control of transport in nanocomposite and nanostructured materials for applications at the energy-water nexus. One avenue of his research is manipulating the structure of materials at the nanoscale to tune the spectrum of thermal radiation. Using this approach, he aims to improve the efficiency of solar energy systems and thermal management of buildings.

Chemical Engineering chair Mark Burns says, "His research in understanding energy transport in nano-scale materials complements our thrust in fuel production and storage. I'm confident he will excel here at Michigan and become one of our best teachers and researchers."

This year, Lenert was named to the Forbes 30 Under 30 list in science, www.forbes.com/30-under-30-2016/science/.



Heather Mayes is starting her lab (Team Mayes and Blue), which will focus on advancing our understanding of fundamental protein-carbohydrate interactions through multiscale modeling. Such studies can complement the wet-lab determination of experimental structural and activity data by simulating dynamics at the atom level to, for example, elucidate a subtle difference between enzymes that allows one to be more temperature-resistant than the other. The applications of this work range from industrial biotechnology (how can we harness microbes to produce renewable chemicals and pharmaceuticals?) to human health (how do gut microbes break down fiber to beneficial chemicals? Can we use protein glycosylation patterns to identify cancer?).

"Heather has an excellent background in computational methods, and we are excited to have her as a member of our Department. I'm certain she will be an outstanding educator and continue to be a leader in her field," notes Chemical Engineering chair, Mark Burns.

Heather already enjoys biofuels-powered commuting, bicycling and walking. When not using high-performance computing to model proteins and sugars, Heather experiments with them in the kitchen. She is a native Midwesterner, born and raised in Illinois, with family roots in Michigan. She will begin her appointment in the Department in January.

Faculty Honors



Mark Burns received the 2016 AIChE Food Pharmaceutical and Bioengineering Award. He was recognized for pioneering advances in the field of microfluidics

including the development of an integrated DNA analysis device and microfabricated components and the successful licensing of that technology.

He was also named one of “25 Chemical Engineering Professors You Should Know” by Online Engineering Programs. The faculty were selected in recognition of their contributions to chemical engineering academia.

Lola Eniola-Adefeso and **Jennifer Linderman** received the 2016 Harold R. Johnson Diversity Service Awards from U–M’s Office of the Provost.



Lola is known as an outstanding educator and a dedicated researcher, and for her commitment to promoting diversity. Within the Department, she has been a champion for women

and underrepresented minority students and faculty members.



As associate dean of graduate education, Jennifer helped the college maintain a diverse and high-performing graduate student body. She is also a key mentor of the college’s women faculty members, and helped lead

the effort to develop the diversity, equity and inclusion strategic plan for the College.



Scott Fogler received an honorary degree on April 15 from Rovira I Virgili (URV) University in Tarragona, Spain in honor of his outstanding contributions to the field of chemical engineering

through his teaching, textbooks, and research. The university awards one honorary degree annually and Scott is the first chemical engineer to receive an honorary doctorate from the URV.



Sharon Glotzer won the Alpha Chi Sigma Award from AIChE. This award “recognizes an individual’s outstanding accomplishments in fundamental or applied chemical engineering research.”

She was also named a Fellow of the American Institute of Chemical Engineers. The honor recognizes both Sharon’s high stature in the scientific community and her service to AIChE and the profession.

Suljo Linic was selected as the winner of the 2016 Michigan Catalysis Society Parravano



Award for Excellence in Catalysis Research and Development. He gave an Award Keynote Lecture at the 37th Annual Michigan Catalysis Society Spring Symposium.



Sunitha Nagrath was promoted from assistant professor to associate professor of chemical engineering, with tenure.



Greg Thurber has won a National Science Foundation Faculty Early Career Development (CAREER) Award.

The objective of his project is to molecularly engineer stabilized alpha helices for generating efficient molecular imaging agents and intracellular therapeutics against currently undruggable targets. These molecules have unique properties, blending classic small molecule drugs and larger biologics. The project will quantify the relationship between the physicochemical properties of the helices and the cellular and in vivo distribution of these molecules. Unique binders with high affinity and stability will be screened using a novel cell surface display technique to develop new therapeutics and imaging agents.



Fei Wen won the Provost’s Teaching Innovation Prize (TIP). Her project was titled “Identify-Solve-Broadcast Students’ Own Mass and Heat Transfer Phenomena.”

She received the award for her creative approach in challenging ChE 342 students with a multimedia assignment, where short YouTube videos were created by student teams showcasing a mass or heat transfer principle. “The Fun of Mass and Heat Transfer” student videos can be viewed at <http://tinyurl.com/FeiWenTIP>.

An article about this work was published in *Chemical Engineering Education* in Summer 2016.



Kotov recognized for achievements in 2016

Nicholas Kotov received a UNESCO Medal this year for his work on biometric self-organization of nano colloids, ultra-strong nanocomposites, tissue engineering with nanomaterials, and nanoscale drugs. “I was proud to represent the University of Michigan, the United States, and all of my students, postdocs, and colleagues who contributed to the research on self-organization of nanoparticles at UNESCO,” Nick says.

This award, established in 2010, is presented each year by the Director-General of UNESCO to prominent scientists, public figures and organizations that contributed to the development of nanoscience and nanotechnologies.

Nicholas Kotov received a UNESCO Medal this year for his work on biometric self-organization of nano colloids, ultra-strong nanocomposites, tissue engineering with nanomaterials, and nanoscale drugs. The Kwolek Award recognizes exceptional contributions to the area of materials chemistry from a scientist working outside the United Kingdom.

Nick was the first scientist to recognize that layer-by-layer (LbL) assembly replicates biomineralized composites found in nature. He duplicated the brick-and-mortar structure of nacre (*Nature Mater.*, 2003; *Science*, 2007) and has created an impressive catalogue of nanocomposites with exceptional mechanical properties. In search of new nanoscale components, he also showed that Kevlar™ macrofibers (Kwolek, 1965), can be transformed into nanofibers (*ACS Nano*, 2011; *Nature Comm*, 2015)

According to one of his colleagues in the field, Nick’s research “has shaped the modern field of composite materials. He has demonstrated the possibility of combining extreme material properties that were once widely believed to be mutually restrictive. His composites not only break records for physical properties, but are also practically feasible.”

The College of Engineering awarded Kotov the Rexford E. Hall Innovation Excellence Award last spring. This award recognizes faculty members who have developed a breakthrough technology or made a significant innovation and demonstrated its transformational potential in engineering practice, the marketplace,



Linderman appointed to University post

On September 1, Jennifer Linderman became the director of Michigan’s ADVANCE, the U–M program designed to improve the campus environment for faculty members and to support diversity and faculty success. Previously she had served as the ADVANCE director for the College of Engineering and as Associate Dean for Graduate Education in the College.

The ADVANCE program aims to improve faculty recruitment and retention and help schools and colleges create a better climate for faculty, students and staff. They also work to develop leadership skills in faculty that will help them establish more positive work environments. The initial funding for ADVANCE was from a National Science Foundation (NSF) grant and was aimed at women STEM (science, technology, engineering and mathematics) faculty. When the NSF funding ended in 2006, the U–M took over funding of the program and expanded its mission to support all faculty in all fields on campus.

When Jennifer was hired as the first woman faculty member in the Department in 1987, there was much less support given to new faculty members. She has long been interested in helping others succeed when they arrive on campus and is pleased with the University’s commitment to supporting faculty with the ADVANCE program. “I especially enjoy helping the many smart and creative new hires get a good start in their academic careers.”

The ADVANCE program offers workshops for faculty campus-wide that provide guidance to faculty search committees about how to attract a diverse and excellent group of applicants. The program also works to support new faculty after they arrive on campus. When new assistant professors begin their careers at Michigan in engineering, for instance, they are assigned their own “launch” committee, which includes their department chair, an ADVANCE-oriented faculty convener, a faculty member from the department, and one from outside the department. The committee meets with the new faculty member once a month for the first two terms and offers practical advice about how to get their research program launched, how to attract students to their group, and how to navigate their new teaching and service responsibilities.

Professor Donahue is enjoying retirement



Frank and Mary Donahue in Ireland

A few years after Frank Donahue started his career at Michigan, he posed for a group photo in front of East Engineering with his ChE and MSE colleagues. Nearly forty years later, when he was an expert witness at a civil trial, he was surprised when the defense attorney produced that same photo and asked Frank to identify himself and name the others in the photo. Apparently, he had some doubts that Frank was who he said he was, a long-time member of the faculty at Michigan. Frank had no trouble identifying the professors and attributes the doubts to his youthful appearance—clearly he didn't look old enough to be in a 1968 faculty photo!

Frank was born in Philadelphia, PA in 1934. After he received a degree in chemistry from LaSalle College, he went to work at a local commercial baking company. There, he made some findings that he later found out demonstrated various principles of chemical engineering. One of his "experiments" was putting thermocouples in the cupcakes he was baking to measure the internal temperature during heating and cooling. At other times, he measured viscosity changes during the heating of non-Newtonian fluids.

He had the opportunity to work with chemical engineers in his next job at a water treatment consulting company. The company wanted to begin an electrochemical program and hired Frank, even though he didn't have any experience or training. The company also

hired a consultant from the University of Pennsylvania. This arrangement ended when the consultant moved on to Stanford Research Institute and offered Frank a job to work in a lab doing early research on fuel cells. With funding from petroleum companies, their task was to find out if hydrocarbon fuel cells were feasible. By 1963, the group determined that they were not.

That year, Frank headed down to Los Angeles to begin a doctoral program in a chemical, nuclear, thermal program at UCLA. While there he had a meeting with Dean Llewellyn Boelter, an expert in fluid mechanics and heat transfer, who strongly encouraged Frank to pursue a career in academia, rather than at an industrial research laboratory.

He joined the faculty at the University of Michigan in 1965 and began his research in corrosion, batteries, and plating. He taught most of the ChE undergraduate courses and graduate courses on corrosion and electrochemical engineering. He also taught an electrochemical engineering short course through the Engineering Summer Conferences program for many years.

Frank says he enjoyed working with his colleagues and still sees a few of them at a weekly Friday lunch at Knight's Steakhouse. Most of the attendees are professors emeriti and the group presently includes Frank, Rane Curl, Jim Wilkes, and Scott Fogler who, though far from retirement, has recently joined the group. They were delighted to have Pete Severn, the former department glass blower, and John Wurster, the former department machinist,

join the group for lunch in June. Dale Briggs, Brymer Williams, Ed Young, and Bob Kadlec were also members of the group for many years.

Frank has discovered that retirement is an opportunity to participate in many activities he didn't get around to when he was working. One of his favorite pursuits is teaching a class at his church where he looks at literature and films and how they relate to moral positions and social teachings of the Catholic Church. He makes DVDs for his students that include a Powerpoint presentation with photos and historical background about the subjects to aid in their discussions.

He has also been volunteering his time to help seniors prepare their tax returns and with the local Society of St. Vincent DePaul, a group that assists people in need. Frank staffs a desk and hands out items such as clothing vouchers, bus passes, and Kroger cards to all who stop by the office.

He and his wife, Mary, have enjoyed traveling to Ireland to visit the land of their ancestors. Mary's family came to the United States in the early 20th century, so they've been able to meet many of her relatives while touring the country. They both love to listen to Irish music groups such as the Clancy Brothers and the Chieftains, but they also have been able to attend concerts by other groups that perform Irish music at The Ark and Conor O'Neil's.

Frank has also spent time studying geology and anthropology in the Southwest U.S. for years. He enjoys the beautiful scenery typical in that region.



Friday Lunch Group: Frank, Scott Fogler, John Wurster, Pete Severn, Jim Wilkes, and Rane Curl

In Memoriam

Dale E. Briggs, 1930-2016



Dale E. Briggs, Professor Emeritus of Chemical Engineering, died on March 17, 2016 at the age of 85 after living a long, productive, and inspirational life.

Dale was born in 1930 in Alton, Illinois, and when he was one year old, his family moved to Pontiac, Michigan. He attended public schools and graduated from Pontiac High School in 1948. Dale enrolled in the Navy Reserve Officers Training Corps and attended the University of Louisville to study chemical engineering, graduating in 1953. He met his wife, Nancy McCoy, while they both served on the student government at college. They married in 1953 in Louisville, KY.

In 1955, the U.S. Navy transferred Dale to the University of Michigan NROTC Unit. He began his teaching career with the freshman class for two years and completed his active duty in 1957. During his time as a teaching fellow, Dale began working with Professor Brymer Williams in Chem-Met 2 in 1958. Their research work in heat transfer developed into many great opportunities and experiences which resulted in Dale being elected to the Board of Directors of the Heat Transfer and Energy Conversion Division of the American Institute of Chemical Engineers while he was still a graduate student.

Dale was appointed as an instructor in 1961 and then promoted to assistant professor upon completion of his PhD in 1968. He was the first professor to require undergraduates to use computers in chemical engineering course assignments. He served as undergraduate program advisor from

1981-1997, during which time he mentored hundreds of students as they prepared for their careers. As program advisor, he was instrumental in broadening the curriculum to permit chemical engineering to become a popular stepping-stone to medical school and other professional degrees.

Over the span of his thirty-eight-year career in the department, he taught almost every subject in the curriculum except kinetics and process control. However, Dale had a special affinity for teaching design, using his expertise from consulting for industries, ranging from petrochemicals to a distillery. Many alumni have fond memories of taking their final ChE course with him.

Dale served in a variety of roles on university faculty committees, including Member of SACUA, 1984-1987; Chief Marshal for University Events, 1991-1999; and Member of the Board of Control of Intercollegiate Athletics, 1994-1998. While on the faculty, Dale received many awards including the Tau Beta Pi Outstanding Teacher Award, 1982; the College of Engineering Outstanding Teaching Award, 1990; and the School of Music, Theatre and Dance Hall of Fame Award, 2016. He served on the faculty until May 31, 1999 when he retired as professor emeritus.

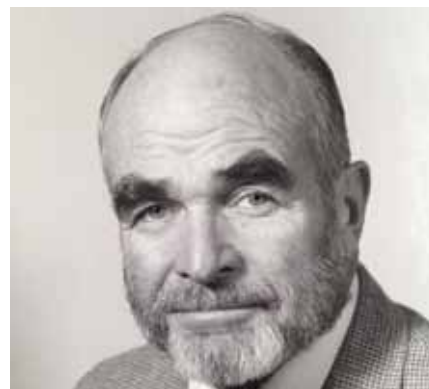
In 1988, he established The Master's Flowers business where he donated flowers to his church, the Veteran's Hospital, the College of Engineering and the School of Music. He taught Bible classes at the Washtenaw County Jail from 2007 until December 2015, and served on more than 100 Doctor of Musical Arts committees. He and his wife established the Dale and Nancy Briggs Chamber Music Endowed Enrichment Fund in 2004, whose earnings have funded the Dale and Nancy Briggs Chamber Music Competition since 2014.

His gentlemanly charm, unwavering support of the ChE Department, and his philanthropy will be greatly missed. Dale is survived by his wife, Nancy, daughter, Susan Clair, son, Stephen, sister, Doris Mason, four grandchildren, and one great-grandson.

Most people who were acquainted with Professor Briggs know that when you saw him in the Dow Building or on campus and asked him, "How are you?" he would almost always reply, "Better." And if you asked him why he was better, he would explain that

"The good Lord asks that we try to make ourselves and the world a little better every day," and adds, "I like to think I'm making a little progress." Those of us who knew him will agree that he succeeded.

John Edward "Jack" Powers, 1927-2016



John Edward "Jack" Powers, an alumnus of our department who served as a faculty member from 1965-1982, passed away suddenly on June 10, 2016 in North Carolina. "Jack was an integral member of the department and he will be missed," says Chair Mark Burns.

Scott Fogler says, "When I came to Michigan, I remember that Jack was willing to take the time to talk to young faculty. He took a genuine interest in us and provided support as we began our careers. I have always been grateful for his help."

His contributions to teaching and research in separations and thermodynamics greatly impacted the field. His thermodynamics laboratory was unique, producing some of the most precise data yet achieved in the calorimetry of gases and liquids near the critical point. Jack made significant contributions to the teaching program in engineering education by the development of a unique problem-solving approach in the teaching of separations science and engineering. He was also very active in industrial consulting in various areas relating to energy resources.

Jack was born in Wilksburg, PA on October 12, 1927. When he was growing up, his family moved often and football was

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In memoriam

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his saving grace. Before Jack's junior year of high school, his family moved to Montclair, NJ. By his senior year, he was vice president of his class and co-captain of the football team. With that famous twinkle in his eye, he used to say, "I was small, but I was slow." Nevertheless, he was always a fierce competitor!

Jack went to Cornell for college, and football. After completing one year, he was drafted, but continued to play football in the Army. After leaving the Army, he chose to go to Michigan to continue his education, where he graduated with honors from the Department in 1951. He played football at Michigan also and was a member of a Big 10 champion wrestling team. On January 1, 1951, he played in the Rose Bowl. The following day, he married Harriet Ann Fenske and moved to California, skiing along the way for their honeymoon.

Marguerite Eileen (Marnie) and Patrick Michael were born in California while Jack earned his PhD in chemical engineering at the University of California, Berkeley. The family moved to Norman, Oklahoma where Jack became the chair of the Chemical Engineering Department. Daughter Judith Lynn was born in Oklahoma. After doing research in Germany for a year, the Powers moved back to Ann Arbor, where Jack taught and did research in the Department of Chemical Engineering until he retired as a professor emeritus in 1982.

After retirement, Jack moved out to Castle Valley, UT, where he played bridge, ran rivers, including the Colorado, and puttered around on his land with his backhoe, dump truck, semi- and cherry picker. He cut down trees in the La Sals, milled the logs, and created "the house that Jack built."

In 2003, he moved to Pittsburgh to live with his daughter and her family. Jack loved the time he spent with Marnie, Jim, and especially his granddaughters, Ruth and Sarah Tynen. Jack moved with the Tynens to Orem, Utah and North Carolina.

Jack was fun, funny, generous, and energetic. He was a great man and he will be missed.

Stuart W. Churchill, 1920-2016



Dr. Stuart W. Churchill, Professor Emeritus in the Department of Chemical and Biomolecular Engineering at the University of Pennsylvania and former University of Michigan faculty member, died on March 24, 2016 at the age of 95. As an embodiment of his entire life and career, he was working on what will be his final manuscript, "Improved Algebraic, Numerical, and Graphical Representations in Fluid Mechanics," a week prior to his passing.

Stuart was born in 1920 in Imlay City, Michigan. He was a freshman at the University of Michigan in 1938; where he played the clarinet in the marching band, and researched a project on retrograde phase-behavior with Donald L. Katz. He went on to obtain his BSE degrees in both chemical engineering and mathematics in 1942. Immediately after college, he went on to work for Shell Oil Company, and then to a technical supervisor role at Frontier Chemical Company.

He returned to the University of Michigan in 1947 for graduate work, and then completed his PhD in 1952. He began teaching at the U-M in 1950 and was promoted to professor in 1957. He served as chairman of the Department of Chemical and Metallurgical Engineering from 1962 to 1967. At the end of his term, Stuart accepted the Carl V. S. Patterson scholarly chair at the University of Pennsylvania. He received the S. Reid Warren Jr. Award for Distinguished Teaching in 1978, and one of Pennsylvania's

first Medals for Distinguished Service in 1993. He advised 25 doctoral students at the University of Michigan and another 20 at the University of Pennsylvania.

Stuart was a leader in the fields of combustion, heat transfer, and fluid dynamics for over half a century. He was a pioneer in the use of computers for modeling chemical and thermal processes and in the development of comprehensive correlating equations based on asymptotic solutions. He published six books and authored over 300 papers, 110 of which were after he retired in 1990. Stuart was elected a member of the National Academy of Engineering in 1974, and in 2002, he won the NAE Founders Award for "outstanding leadership in research, education, and professional service, and for continuing contributions in combustion, heat transfer, and fluid dynamics for over a half a century."

In celebration of his 90th birthday, Stuart was honored with a Festschrift in the August 2011 issue of *Industrial and Engineering Chemistry Research*, a leading archival journal in chemical engineering. The Festschrift noted, "Stuart's breadth extends far beyond that of most engineering science researchers," a fact that is reflected in his winning numerous awards including the AIChE Professional Progress Award and the ASME Max Jacob Award in Heat Transfer.

He returned to Michigan in 2010 when Professor Sharon Glotzer, was installed as the "Stuart W. Churchill Collegiate Professor of Chemical Engineering." The department celebrated Stuart's 90th at the Gandy Dancer restaurant following the ceremony.

Through the decades of scholarly mentorship of colleagues and students on matters of science and technology, Stuart also enjoyed a fruitful life in his love of music, art, literature, nature, travel, fine food and wine, sports, and verbose political discussions. In his passing and as a true man of science, Professor Churchill's body was contributed for scientific studies. He will be greatly missed by many. Stuart is survived by his wife, Renate, and his children, Stuart L., Diana, Catherine, and Emily.

The Fifth Annual ChE Graduate Symposium

Industry representatives from Dow Chemical, Procter and Gamble, Shell, Dow Corning and Owens Corning attend

By Corine Jackman and Megan Dunn



The Fifth Annual Chemical Engineering Graduate Symposium was held at the Gerald R. Ford Presidential Library on May 12. The event brought together graduate students, faculty, and industry representatives from Dow Chemical, Procter and Gamble, Shell, Dow Corning and Owens Corning to discuss the innovative research conducted by Michigan graduate students. We thank Dow Chemical, Procter & Gamble, and Shell for their sponsorship of this year's symposium.

Our visitors from industry were Paul Witt, Megan Donaldson, Aaron Shinkle, and Gregory Stewart from Dow Chemical; Scott Osborne from Procter & Gamble; Justin Ceterski from Shell; Matt Shumaker and Julia Faeth from Owens Corning; and Michael Molnar from Dow Corning.

The all-day event was organized by graduate students, and featured oral presentations, poster presentations, and networking breaks, as well as a keynote presentation by University of Michigan alumna Rosemarie Wesson (PhD '88), Associate Dean of Research at the Grove

School of Engineering at City College of New York (CCNY). Before joining the faculty at CCNY, Wesson worked for thirteen years at the National Science Foundation as a director and program director. Previously, she was a faculty member at Louisiana State University in Baton Rouge, LA and a senior research leader at Dow Chemical. Dr. Wesson was the first African-American woman to earn a PhD in chemical engineering from the University of Michigan. You can read more about Dr. Wesson on page 17.

Awards for oral and poster presentations were given to the top three presentations in both categories as chosen by a panel of faculty and industry representatives. There were 14 oral research presentations given by PhD candidates within 18 months of graduation. The top award in this category went to Wenjun Huang from the Larson group. The second place award went to Daniel Sobczynski from the Eniola-Adefeso lab, and third place was awarded to Margaret Fish, who is also advised by Lola Eniola. Nearly every group in the department was represented in the poster session. First place in the poster session went to Tianhui (Maria) Ma from the Solomon group, second place to David Hietala from the Savage group, and third place was awarded to Joseph Ferrar from the Solomon group.

The event was also a time to recognize the work of exceptional students from the department in research, service, and teaching. The winner of the research award is nominated and chosen by faculty in the department and this year was awarded to Sheng Zheng from the Fogler group. The service award recipient, who was nominated by either faculty or students and voted on by faculty, went to Corine Jackman from the Lin group. Liam Casey, from the Shea group, won the teaching award for his work as a graduate student instructor in ChE 330 (Thermodynamics). Undergraduate students nominate instructors for this award, with the faculty making the final selection.



Tirrell is 2016 Katz Lecturer

David A. Tirrell presented the 46th Annual Donald L. Katz Lectureship in Chemical Engineering. Tirrell is the Ross McCollum-William H. Corcoran Professor of Chemistry and Chemical Engineering at CalTech, where he is also the Director of the Beckman Institute. He delivered two lectures during the event on April 28-29. His first lecture was on "Non-Canonical Amino Acids as Probes of Protein Synthesis in Complex Biological Systems" and his second was on "Reinterpreting the Genetic Code: How to Do It and Why You Might Want to."

Tirrell's research interests lie in macromolecular chemistry and in the use of non-canonical amino acids to engineer and probe protein behavior. His contributions to these fields have been recognized by his election to the American Academy of Arts and Sciences and to all three branches (Sciences, Engineering and Medicine) of the U.S. National Academies.

He was honored at a dinner on Thursday night at the Gerald R. Ford Presidential Library. Also recognized at the dinner were 21 doctoral students who will graduate this year. Before the dinner, Professor Emeritus Jim Wilkes spoke about Donald Katz's career and his many contributions to the Department and the field of chemical engineering.

Graduate Student Corine Jackman in photo above

Blood Biopsy

Releasing cancer cells for better analysis.

By Kate McAlpine
Marketing & Communications
College of Engineering

A new device developed at the University of Michigan could provide a non-invasive way to monitor the progress of an advanced cancer treatment. It can pick cancer cells out of a blood sample and let them go later, enabling further tests that can show whether the therapy is successfully ridding the patient of the most dangerous cancer cells.

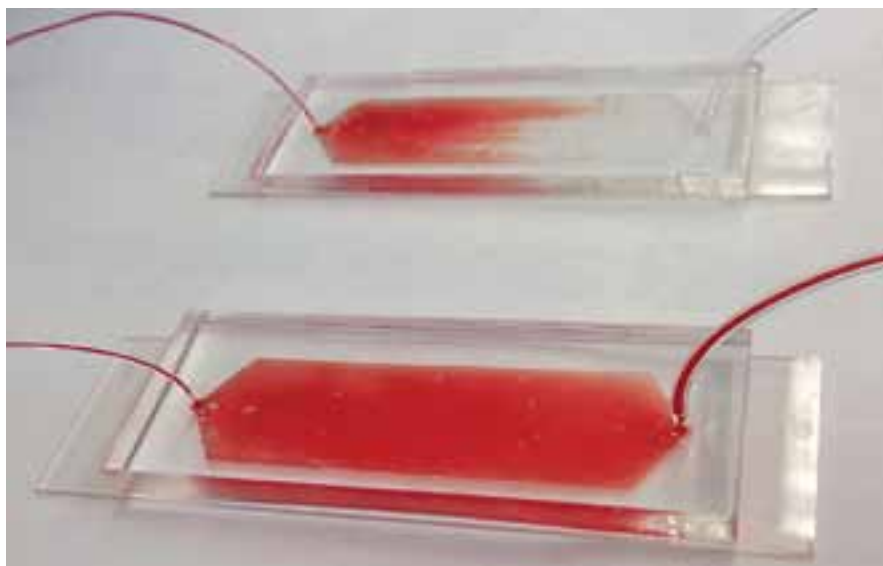
Cells released into the bloodstream by tumors could be used to monitor cancer treatment, but they are very difficult to capture, accounting for roughly one in a billion cells, says Sunitha Nagrath, associate professor of chemical engineering.

Nagrath and her collaborators pioneered technologies for capturing these cells from blood samples. Their devices trapped the cells on chips made with graphene oxide, a single layer of carbon and oxygen atoms. But all analysis had to be done on the chip because the cells were firmly stuck.

“We could grow the cells on the chip or analyze them all together, but research has shown that cancer cells are not all the same,” she said. “Hence, it is important to study cells individually, and our new device makes this possible.”

The stem cell theory of cancer holds that relapses occur because chemotherapy and radiation therapy are not very effective at killing cancer stem cells, which can make up as much as 10 percent of a tumor. As a result, the cancer stem cells left behind are able to regrow the tumor or spread to other areas of the body.

New treatments in clinical trials attack the stem cells, but killing this smaller population



does not immediately shrink the tumor. Doctors need a good way to monitor whether the cancer stem cells are on the decline. This may be possible through blood tests, but clinicians need to study captured cells individually, and that means removing them from the chip.

“How can we release the cell without damaging it—that’s the name of the game,” said Jinsang Kim, professor of materials science and engineering and chemical engineering, who co-led the project with Nagrath.

Kim works on design principles to create chain-like molecules with particular capabilities, and his team devised a solution. His group developed a polymer that is solid at room temperature but falls apart at a temperature that can be set anywhere between about 40 and 68 degrees Fahrenheit.

The polymer dissolves in water when it interacts with water molecules. At higher temperatures, heat breaks up the interactions, so the polymer doesn’t dissolve. Apoorv Shanker, a graduate student in macromolecular science and engineering, set the polymer to dissolve at temperatures below 54 degrees. The team mixed the tiny cell-catching graphene oxide flakes into the polymer and built the chip into a device to guide the blood sample over it.

“It’s very gentle for the cells,” said Nagrath, contrasting the slight dip in temperature with other designs that rely

on heating or enzyme-induced chemical reactions to release the cells.

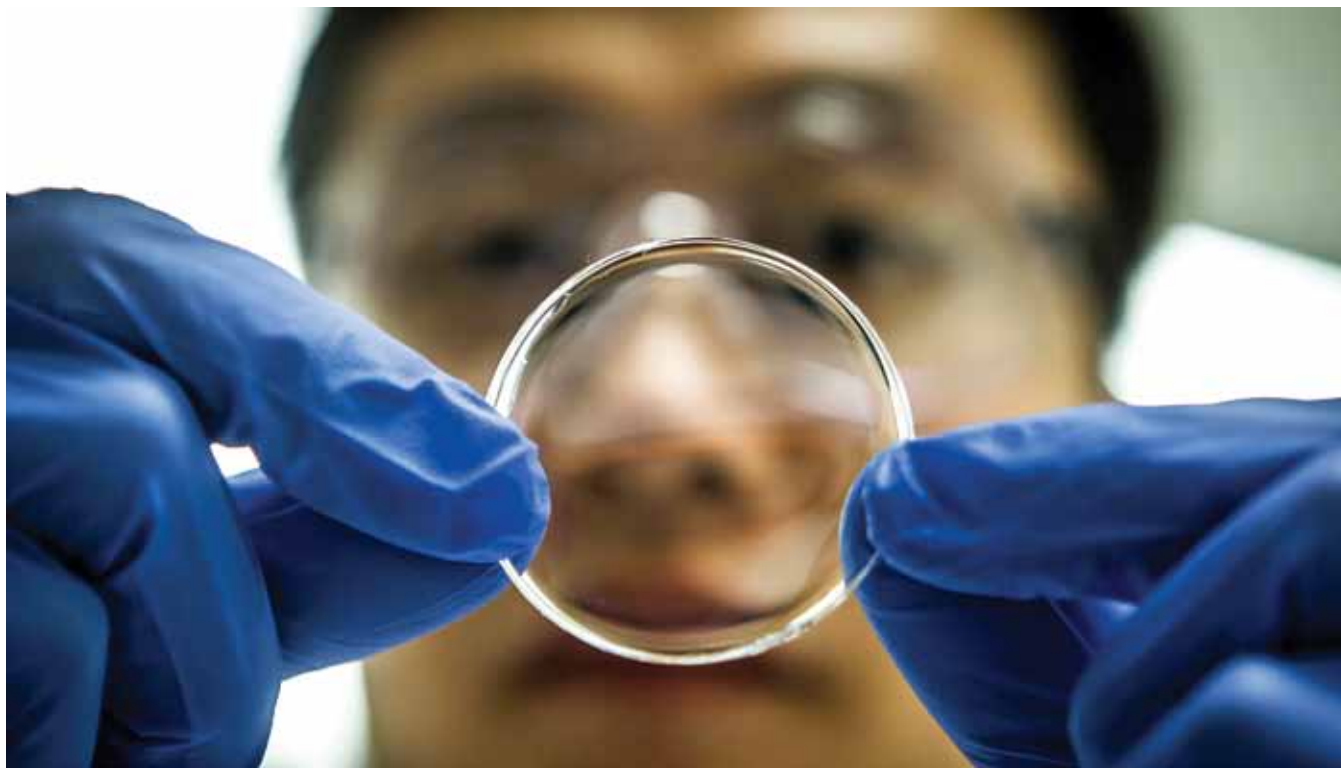
The device can capture and live-release up to 80 percent of the cancer cells in the initial blood sample. Then, the clinicians could collect the cells into a tissue-like sample for conventional analysis, which can reveal the proportion of captured cancer cells that are stem cells. Alternatively, they could identify single cells for more detailed study, such as full genetic sequencing or tests that identify which drugs would be most effective.

“Because the device is easy and cost-effective to make, large-scale clinical studies are possible,” Kim said.

The study was done in collaboration with the group of Max Wicha, professor of oncology, and the group of Diane Simeone, professor of surgery and molecular & integrative physiology. It is described in the paper, “Tunable Thermal-Sensitive Polymer-Graphene Oxide Composite for Efficient Capture and Release of Viable Circulating Tumor Cells,” which recently appeared in *Advanced Materials*.

The research was supported by the U.S. National Institutes of Health, the Republic of Korea’s Ministry of Science, ICT and Future Planning, and the U.S. National Science Foundation.

U–M is pursuing patent protection for the technology and is seeking partners to bring it to market.



Flexible film may lead to phone-sized cancer detector

Film provides a simpler, more cost-effective way to produce circularly polarized light, an essential ingredient in a process that could eventually provide an early warning of cancer recurrence

By Gabe Cherry

Marketing & Communications, College of Engineering

A thin, stretchable film that can coil light waves like a Slinky could one day lead to more precise, less expensive monitoring for cancer survivors. The researchers who developed the film say it could help patients get better follow-up treatment with less disruption to their everyday lives.

The film provides a simpler, more cost-effective way to produce circularly polarized light, an essential element in a process that could eventually provide an early warning of cancer recurrence. The film is detailed in a paper published online in *Nature Materials*.

“More frequent monitoring could enable doctors to catch cancer recurrence earlier, to more effectively monitor the effectiveness of medications, and to give patients better peace of mind. And this new film may help make that happen,” said Nicholas Kotov, author of the paper.

Circular polarization is similar to the linear version that’s common in things like polarized sunglasses. But instead of polarizing light in a two-dimensional wave, circular polarization coils it into a three-dimensional helix shape that can spin in either a clockwise or counterclockwise direction.

Circular polarization is invisible to the naked eye, and it’s rare in nature. That makes it useful in an up-and-coming cancer detection process that looks to be able to spot telltale signs of the disease in the blood. Currently in the research stage in Kotov’s lab, the process requires large, expensive machines to generate the circularly polarized light. Kotov believes the new film could provide a simpler, less expensive way to induce polarization.

The detection process identifies biomarkers—bits of protein and snippets of DNA—that are present in the blood from the earliest stages of cancer’s recurrence. It starts with synthetic biological particles that are made to be attractive to these biomarkers. The particles are first coated with a reflective layer that responds to circularly polarized light, then added to a small blood sample from the patient. The reflective particles bind to the natural biomarkers, and clinicians can see this when they examine the sample under circularly polarized light.

Kotov envisions that the film could be used to make a portable, smartphone-sized device that could quickly analyze blood samples using the technique. The devices could be used by doctors, or potentially even at home, to monitor for the recurrence of cancer in patients who are in remission.

“This film is light, flexible and easy to manufacture,” Kotov said. “It creates many new possible applications for circularly polarized

Continued on page 14

Graduate Peer Mentoring Program

By Margaret Fish

The Chemical Engineering Graduate Peer Mentor Program, inaugurated in the 2015-2016 academic year, has been a resounding success! The program, which matched senior graduate students with incoming first-year graduate students (in photo to the right), was directed by Graduate Chair Lola Eniola-Adefeso. Her plan was to provide an additional source of support to our new students while fostering camaraderie within each group. An additional goal was to prepare the students to become excellent representatives of the Department once they leave the University.

Six senior graduate students were chosen as peer mentors based on their academic, research, and leadership skills. Each mentor was assigned a group of about 6 graduate students, purposely mixed in gender, program (MS or PhD), race, nationality, academic background, and research interest. Mentors hosted a variety of events including study groups, meals, and social events.

To assist them academically, students were provided with focused preparation for the first-year qualifying exams and encouraged to study with a variety of others. In addition, the program gave increased assistance to our international students to help them settle in and feel more comfortable about participating in departmental events during their first year.

Feedback indicated that the increased support made it easier for all the newer students to adjust to graduate school and that several were



grateful to have someone to discuss issues with that were difficult to talk about with faculty. First year Kathryn Bumila stated that, “I was able to connect with people that I may not have otherwise and was offered a safe place to discuss troubles and triumphs. It was very helpful to receive advice from a mentor who had been in our shoes and could understand our concerns, thus offering genuinely useful advice.”

Mentors gained valuable experience as they served as leaders to the junior graduate students. According to mentor Claudio Vilas Boas Favero, the program was “an opportunity to test the water and see what it is like to mentor graduate students, providing a unique experience for someone like me who is considering becoming a professor.”

Graduate peer mentoring will continue this year and aims to improve upon the successes of the first year.

Kotov

CONTINUED FROM PAGE 13

light, of which cancer detection is just one.”

Another key advantage of the film is its stretchability. Light stretching causes precise, instantaneous oscillations in the polarization of the light that’s passed through it. This can change the intensity of the polarization, alter its angle or reverse the direction of its spin. It’s a feature that could enable doctors to change the properties of light, like focusing a telescope, to zero in on a wider variety of particles.

To make the film, the research team started with a rectangle of PDMS, the flexible plastic used for soft contact lenses. They twisted one end of the plastic 360 degrees and clamped both ends down. They then applied five layers of reflective gold nanoparticles—enough particles

to induce reflectivity, but not enough to block light from passing through. They used alternating layers of clear polyurethane to stick the particles to the plastic.

“We used gold nanoparticles for two reasons,” said Yoonseob Kim, a graduate student research assistant in the Department and an author on the paper. “First, they’re very good at polarizing the kind of visible light that we were working with in this experiment. In addition, they’re very good at self-organizing into the S-shaped chains that we needed to induce circular polarization.”

Finally, they untwisted the plastic. The untwisting motion caused the nanoparticle coating to buckle, forming S-shaped particle chains that cause circular polarization in light that’s passed through the plastic. The plastic can be stretched and released tens of thousands of times, altering the degree

of polarization when it’s stretched and returning to normal when it’s released over and over again.

While a commercially available device is likely several years away, cancer detection is just one of several possible applications for the film. Kotov envisions the use of circularly polarized light for data transmission and even devices that can bend light around objects, making them partially invisible. The University of Michigan is pursuing patent protection for the technology.

The paper is titled “Reconfigurable chiroptical nanocomposites with chirality transfer from the macro- to the nanoscale.” Funding was provided by the National Science Foundation and the United States Department of Defense.



Glassblower retires after 25 years

Eberhart's exceptional skills were important to Department's research

Harald Eberhart retired from the Departments of Chemical Engineering and Materials Science Engineering in June 2016, after 25 years of service as a glassblower to the University. Both departments hosted a reception for him where faculty praised Harald for his years of outstanding work and spoke about how important his unique talents were to the success of many research projects.

"The retirement of Harald Eberhart, our glass blower extraordinaire, is a big loss to our department," Johannes Schwank, a former chair in ChE who hired Harald, told the guests. "Scientific glass blowing is of vital importance for maintaining a vibrant experimental program in chemical and materials science engineering, chemistry, and many other disciplines. Harald's work has enabled our faculty and students to work with one-of-a-kind equipment, custom-built to exacting specifications. Such equipment cannot be purchased off the shelf, but is crucial as it opens the door to experimental approaches that would be difficult, if not impossible, to do with commercial equipment."

Another former chair, Ron Larson said, "I'll always remember Harald for his superb craftsmanship! He sustained an 'old-world' attitude towards quality in hand-crafted manufacture." He added, "In the world of mass production, he maintained and constantly honed his skill in a field where standardization was not possible—specialty glasswork."

Not only was he valued by the faculty, but Harald was a friend and mentor to many ChE and MSE students, helping them solve challenging problems with their experiments and even giving them advice about improving their experimental set-ups. He also gave countless glass demonstrations to middle school and high school students and their parents through the years.

Harald was born in Graz, Austria. His father, Wolfgang, was a glassblower who apprenticed and received a master glassblowing degree in Vienna after eight years of schooling. He brought his family to Canada in 1960 and couldn't get a glassblowing job in Canada because their government didn't recognize scientific glassblowing yet as a profession. Years later he was able to move into a glassblowing job at the University of Windsor, where he worked for 13 years before starting his own business.

Harald was an apprentice with his father at the University of Windsor for four years and went on to become the youngest member of the American Glass Blowers Society. Before coming to Michigan, Harald was a master scientific industrial glass blower at Dow Chemical in Midland for 16 years, where he worked on projects on a very large scale.

He was hired by the Departments of Chemical Engineering and Materials Science and Engineering in March 1991, when Pete Severn retired. At Pete's suggestion, Harald applied for the position just before the job posting closed. "I was delighted to have the opportunity to work with faculty and students once again," he said.

Since retiring, Harald has taken trips to Utah, Arizona, Nevada, and Mexico. He says he appreciates all the time he has to spend with his friends and enjoys teaching the Bible at the local Jehovah Witness Kingdom Hall. He has recently discovered Pinterest and loves to share recipes, cooking hints, and travel and nature scene photography with others.

Fred Shippey

Photography has been a long-time interest at work and as a hobby



Fred Shippey (BSE '62, MSE '70) says he has had a non-traditional career. While this is not uncommon for many chemical engineers today, the typical ChEs of his generation spent all of their working lives at one company. "I had four different careers: At Ford, at the Air Force, with Kodak, and finally as a consultant."

Fred grew up in Ann Arbor and after high school decided to study chemical engineering at Michigan. He was interested in photography and got a job in the photography department of Follett's Bookstore on State Street for most of his time as an undergraduate. He also served as a photographer for the Michigan Daily and the Michiganensian yearbook. He had the opportunity to take photos of John F. Kennedy's visit to the Michigan Union in October 1960, where Kennedy proposed the idea of the Peace Corps. Fred was the only photographer to shoot colored slides that day; all other photographs were black and white. One of his photos from that day is



This photo is also displayed in U-M President Mark Schlissel's home for a Bicentennial exhibit, which will run through 2017.

displayed at the JFK Presidential Library and Museum in Boston (photo below).

In addition to his chemical engineering classes, he took advantage of chemical engineering and metallurgical engineering being in the same department and enjoyed taking a class in the foundry in East Engineering, where he got to make molds, and do casting and welding. He says that when he had any questions on his major he went to Brymer Williams. "He was not judgmental so Brymer was the professor to talk when you needed advice." He attended Brymer's memorial event in 2003 and was able to thank Brymer's family for "sharing him with the students."

After he graduated in 1962, he took a job with Ford in Dearborn and was there when they were developing the Mustang. Those were interesting days to work in auto industry, he says, because they were the last days of the powerful U.S. auto industry. "The Japanese were starting to get into the car business and the US companies weren't quite sure how to react," Fred remembers. "Most of them felt it was dangerous to be too innovative. After all, you didn't want to have another blunder like the Ford Edsel."

He had considered joining the military when he graduated from college. After two years at Ford, he still was interested and decided to join the U.S. Air Force and was immediately sent to officer's training school. As a maintenance officer, Fred learned to be a good manager and was happy to use his engineering problem solving skills to analyze problems with aircraft. Initially he was stationed at the Eglin Air Force Base in the Florida panhandle. He was eventually sent to Mactan Island in the Philippines and, for 90 days, to Saigon, Vietnam.

After five years of active duty, he decided to go back to school for a master's degree. He wanted to come back to Michigan but the Air Force wanted him to go to another school, so he left active duty and headed back to Ann Arbor. He didn't entirely leave the military, though,

and stayed in the Air Force Reserves for another 25 years, retiring as a colonel.

After working with Frank Donahue for his master's studies, he got a job offer from the Eastman Kodak Company, where he was hired as a photographic engineer. Kodak, like other companies, liked to hire ChEs because of the breadth of their educational background and had their own photographic science training program that Fred and others were sent to for the needed skills.

While at Kodak, Fred worked with the Kodak Research Labs and *Time* magazine on a prototype digital still camera and he participated as a member of teams developing several early electronic imaging products and programs. He served as the group leader of a software development group working on digital image processing algorithms. He also furnished technical applications support to marketing and customers and assisted marketing with the analysis of competitive products.

He left Kodak in 1993 and became a self-employed consultant and a technical writer. Today he stresses the importance of communications studies for young engineers. "If you want to succeed, you need to have good written and spoken communication skills to convey your message to your fellow workers," he says. He is glad to hear that technical writing and communications are an important part of many chemical engineering courses today.

Fred remains busy in the photography world as a writer and teacher of electronic imaging technology and applications both in the U.S. and overseas.

Fred and his wife, Susan, have two daughters and both are Michigan grads. Beth lives in the Ann Arbor area and has two sons. Sara lives in the Fairfax, VA area and has a son and a daughter. He regularly returns to his hometown to visit his daughter.

He served on the Michigan Engineering Alumni Board for six years and has also been able to join the Department many times at the annual department luncheon during homecoming weekend. One homecoming week he was even an impromptu replacement for the ChE 230 ethics session when one of speakers was unexpectedly called away. We can always count on Fred to help out when needed!



Rosemarie Wesson

First African-American woman to receive PhD from Department

Rosemarie Wesson (MSE '85, PhD '88) was the first African-American woman to receive a PhD in chemical engineering at Michigan. When she arrived in the Department in 1984, there were only two other African-American students in the graduate program. Professor Levi Thompson was one of those students, and he and Rosemarie became great friends during her time in Ann Arbor. She remembers that there was a Black Graduate Student Association when she arrived but the group didn't really get off the ground because there were never more than a few members who attended, although they maintained a support network during their time here.

Rose was raised in Illinois and completed her undergraduate studies at MIT. After graduation, she went to work as a research engineer at Dow Chemical Company for three years before she started the doctoral program. While at Dow, she took an extension graduate course in Midland in fluids (ChE 541) with Jim Wilkes. "Rose excelled at her classwork, to the extent that I encouraged her to apply for the graduate program in Ann Arbor, which she did and I had the privilege of being her doctoral supervisor," Jim says.

When she arrived in Ann Arbor in 1984, women were scarce in the Department's doctoral program also. Rose quickly became friends with Liz Batesole, another student in the Wilkes' group. They were both pleased to see that number increase steadily while they were on campus.

Rose had worked with polymers at Dow and was interested in pursuing that area for her doctoral studies with Jim and the recently hired Tasos Papanastasiou. Unfortunately Tasos had to take a medical leave in winter term of her first year, so Jim assisted her during that crucial first year.

In spite of her early challenges, Rose has always been happy with her decision to come to Michigan. She particularly enjoyed Scott Fogler's reaction engineering course. She took the course when he was writing his textbook and remembers the binders he provided to the students filled with his notes. He would always challenge them to find errors. "This made the course even more exciting," according to Rose, "because we had helped in the 'creation' of his new text, and felt as though we were part of a project that was going to be important to the future of chemical engineering education."

She also remembers Jim Wilkes' numerical methods course. Rose says she liked the challenges of computers and spent many hours in the CAEN lab improving her FORTRAN skills. She went one summer to the University of Minnesota to take a month-long computing course where she got to study parallel computing and worked on the world-famous Cray computer. She was one of the first students to use computers extensively in her research and her dissertation topic was the computer-aided analysis of viscoelastic flow.

While she was a student, Rose married Billy Williams, a coworker that she had met at Dow. She and her husband were honored to

have Professor Wilkes play the organ at their wedding in 1986!

Rose returned to Dow for a few years after she completed her PhD in 1988, where she continued to work in the areas of polymers and polymer rheology. In the early 1990s, she spent a few years in academia at Louisiana State University and at Battelle Memorial Lab as a principal researcher. She accepted another position at Dow as senior research leader in the Corporate Materials Science Research and Development Lab, providing leadership in their polymer rheology research area.

Rose began her thirteen-year career at the Engineering Directorate of the National Science Foundation (NSF) as a visiting scientist/engineer in 2001, while on a leave from Dow. Her last position at NSF was as program director for the Chemical and Biological Separations Program in the Chemical, Bioengineering, Environmental, and Transport Systems Division.

At NSF, she learned about the structure of the federal government, politics, and how the government truly operates, not only at NSF. She realized how poorly engineers and scientists are prepared for the politics of Washington. She encourages engineers today to take public policy courses and to improve their communication skills so they can more effectively make sure their message is heard and understood by politicians, bureaucrats and, most importantly, the general public. "Engineers can have great impact in shaping the policies of this country if they can avoid coming across as eggheads," she says.

Last fall, she became the Associate Dean for Research in Engineering at the City College of New York. Rose is a Fellow of the American Institute of Chemical Engineers and has served on its Board of Directors.

She returned to Ann Arbor in May to be the keynote speaker at the 2016 ChE Graduate Symposium. She has been a member of the Chemical Engineering Alumni Board for several years and will serve as 2016-2017 chair of the board.

Jim Wilkes says of Rose, "The greatest enjoyment of being an 'academic' is to see how your students progress both at the university and in their subsequent careers, Rose has fulfilled all that is expected of a highly gifted and motivated student."

2016 Fall Alumni Events



Friday, October 21, 2016

12:00-1:30 p.m.
Lunch with the Department
Johnson Rooms
3rd Floor, Lurie Engineering Center
1221 Beal Avenue

Please join us on October 21 for our annual department luncheon. Warren Seider (MSE '63, PhD '62), Professor of Chemical and Biomolecular Engineering at University of Pennsylvania and former ChE Alumni Advisory Board member, is this year's ChE Alumni Award winner, and he will speak at the event.

If you would like to join us, please contact Sandy Swisher, 734-764-7413 or sandys@umich.edu, or sign up for the lunch when you are making homecoming reservations through the College of Engineering at www.engin.umich.edu/college/info/alumni.



Monday, November 14, 2016

7:00 p.m.-9:00 p.m.
Annual AIChE Meeting Reception
Golden Gate 7/8
Hilton San Francisco Union Square
San Francisco, CA

We invite you to join us for our annual open house in San Francisco. If you are attending the meeting or live in the area, please plan to stop by and visit with faculty and students.

If you have any questions about the open house, please contact Kelly Raickovich at raick@umich.edu or 734-647-6207.

Internship opportunities a plus

Many alumni are generous about informing us of internship opportunities at their company, which our students greatly appreciate, as you can see from these notes:

"Thank you for initially reaching out to me when I had so many questions about my future path. Because of your response and recommendation for an internship, I now have a full time job doing something that I love. I couldn't be more thankful for your guidance!"

"Thank you so much for the advice and guidance you have given me during my job search. I am so grateful for the opportunity that I now have, thanks to you, to work in a job I am so excited about. Thank you for donating your time and energy to help me, I really appreciate it."

"I really appreciate you reaching out to Dr. Montgomery about internship opportunities. I love the internship I was able to find because of you. It has allowed me to learn a ton and get hands-on experience in chemical engineering. Thank you for sharing this opportunity!"

If you have an opening for an individual internship, co-op, or permanent position for a chemical engineering student, please contact Dr. Susan Montgomery, Undergraduate Program Advisor, at smontgom@umich.edu. For more extensive recruiting assistance, we encourage you to visit the Engineering Career Resource Center at career.engin.umich.edu.

Consider a gift to our textbook fund

In 2010, we started a program to provide textbooks for undergraduate students who cannot otherwise afford them. As you can see from the following comments, our chemical engineering students have benefited from this program.

"Having a textbook greatly transformed the way I study," remarked one student. "When I did not understand a specific topic taught in lecture, I was extremely relieved that I could go back home and read through related topics once more. Now, it has become a habit, and I always review the topics after lectures. This program has not only tremendously helped me financially, but more importantly it made me into a better student."

Another student says, "I can't even begin to tell you how getting free textbooks helped me last year. I probably wouldn't have bought them otherwise. Having textbooks made me feel more in control of my work, study habits, and time management."

We thank all of you who have already made contributions to the department to assist us in purchasing textbooks for about two dozen students a semester and we encourage others to consider a donation.

Gifts made by check can be sent directly to the department, to the attention of Pam Bogdanski, indicating "UG textbooks" in the check memo. Please complete the form on page 22 and write in "UG textbooks" in "OTHER" and send both to the address listed on the form.

If you would prefer to make a credit card donation, please contact Pam at pbog@umich.edu.

News from Alumni

Ralph E. Hillman (BS '50, MS '53) and his wife celebrated the birth of their eleventh great-grandchild and also celebrated the wedding of their seventh (of nine) grandchildren in late May.

Jim Ryan (BS '54) has relocated with his wife, Nicole, to Shell Point Retirement Community southwest of Fort Myers, Fl. He retired from Koch Industries (Wichita) in 2000.



Ivan A. Franson (BS ChE '59, BS MetE '59) and his wife, Barbara, celebrated 55 years of marriage with family (18 in all) by cruising in the

western Caribbean over New Year's Day weekend.

After leaving Michigan, Ivan travelled the metallurgical route, earning an MSc and PhD in metallurgy from Stevens Institute of Technology while working in research for International Nickel Company and Air Reduction Company. Market/product development positions with Airco Vacuum Metal, Titanium Metals Corporation, and Allegheny Ludlum Steel Corporation (ALCS) followed. Ivan's position at retirement from ALCS was manager of Stainless and Alloy Metallurgy.

One of Ivan's most enjoyable experiences was participating in a bed-and-breakfast business, the Main Stay B&B, that Barbara started and ran for five years in historic Saxonburg, Pennsylvania. Through many moves, Ivan and Barbara remained active in church activities, particularly singing in the church choirs. They have also returned to Ann Arbor for occasional football games with family and former U-M alums.



Over the years, **Paul Horst** (BSE '72) and his wife, Nancy, have logged over 40,000 miles cruising the world aboard their sailboats. After

Paul retired in 1995 from Nematron, an industrial computer company he founded, they went sailing for two years, and then Paul worked five more years as president of DTE Energy Technologies, the alternative energy subsidiary of DTE Energy. More recently Paul has been chairman of Algal Scientific, a biotech company founded by his son and other U-M graduates.

Tim Donakowski (BSE '73) retired in December 2015 after careers with the Ford Motor Company, Illinois Institute of Technology, the Minnesota Department of Health, and Minnesota OSHA.

In June 2015, **Jim Medalie** (BSE '81) joined SIMONA America Inc., as their president. The company is located in Scranton PA and is a manufacturer of plastic semi-finished products.

Deepak Pandya (MSE '81), based in Singapore since 2008, has been at KBC Advanced Technology for the past five years. He is now the global functional manager for Strategic Consulting and is enjoying his time in Singapore. A few more years to retirement!

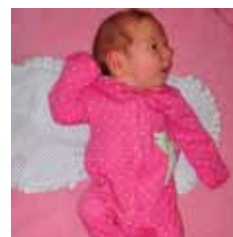
David B. Harwood (BSE '83) is the director of DTE Energy's Renewable Energy organization, which is responsible for project development, regulatory compliance, operation, and purchase power agreements representing almost 1,000 megawatts of renewable energy generating capacity in Michigan. DTE has invested over \$1.5 billion in Renewable Energy since 2009 and has 100 megawatts of new renewable capacity currently under construction, including the largest utility-owned solar array east of the Mississippi, located in Lapeer, MI.

Julia (Boeker) Pepper (BSE '84) is enjoying early retirement and working to relocate to Lake Norman, NC, after which she hopes to use all those previously developed corporate skills in the not-for-profit sector!

Matt Gdowski (BSE '94) is in his 20th year with the Parker Hannifin Corporation, currently as a continuous improvement manager based out of Metamora, OH. This coming fall his oldest son, Zachary, will be attending the University of Michigan to study engineering.

Pete Valianatos (BSE '94) attended the 2016 National Inventors Hall of Fame in Washington, D.C. when the founders of E Ink were inducted into the hall as transformative innovators of electronic paper displays (invent.org). He has also been named as acting associate vice president of development at E Ink.

Christopher W. Jones (BSE '95) was recently recognized with the 2016 Andreas Acrivos Award for Professional Progress in Chemical Engineering by AIChE. One of the 'big three' AIChE Awards, he was recognized for his research on supported molecular catalysts, CO₂ capture and sequestration, and his leadership of the journal ACS Catalysis. Jones is a member of the U-M ChE Alumni Board, and works at Georgia Tech where is a Love Family Professor of Chemical & Biomolecular Engineering and the Associate Vice President for Research.



Tanya (Manson) Sullivan (BSE '96) and her husband, Tom, welcomed daughter, Sophia Elizabeth Sullivan, on March 10, 2016. Sophia has two big sisters, Amelia (6), and Alexandra (4).

Honesty Johnson (BSE '97) has been working at Amcor Rigid Plastics for 15 years as an injection tooling engineer.



Eric Bernath (BSE '00) has recently decided to depart Los Angeles and embark on a 20,000-mile motorcycle journey from Alaska to Patagonia.

Along the way, he intends to engage with local health clinics to champion innovative approaches to healthcare delivery in the developing world. His adventure will be posted on TwoWheelsOneJourney.com and on Instagram @twowheelsonejourney.

Continued on page 20

Alumni News

CONTINUED FROM PAGE 19

Dan Merenda (BSE '00) has accepted the position of resident office manager for Orbital ATK at NASA's Marshall Space Flight Center in Huntsville Alabama. He is in the process of relocating from their facility in Northern Utah. Orbital ATK is NASA's prime contractor for building the solid rocket boosters used on the Space Launch System (SLS). SLS is the vehicle that will lead the nation into a new generation of deep space exploration!



Carly Bosco (BSChE '01) and her husband, Jacob, and big sister, Celia, welcomed a new daughter to the Bosco family, Maria Susannah, who was born July 3, 2015.

The Boscos remain in Hampton Roads, VA, where Carly works as a research director for NASA Langley Research Center.



Brandon (BT) Cesul (ChE '01, MEngSpSys '02) and his wife, Karen, welcomed their third child into the world, Lianna Marie, in February. She joins her two siblings, Ella

& Cazzie, and is excited to be the first Cesul child not only made of Michigan parts, but born in Michigan as well! BT is continuing to work at his new employer, Integrity Applications Incorporated, as a senior scientist out of their Ann Arbor office. He and his family moved into their newly built house in Saline in September.



Julie Champion (BSE '01) was promoted to associate professor with tenure in the School of Chemical & Biomolecular Engineering at the Georgia Institute

of Technology. She and her husband, Kevin Boulware, also welcomed their son, Cooper

Vic Boulware, into the world just a few hours after watching U-M win the 2016 Citrus Bowl.

Brian Teller (BSE '01) has recently completed his MBA and MS finance degree at the Kelley Business School. He has taken a new position at ITW as the category manager for films & chemicals. He and his family are relocating to the Chicago area.

Carrie (Lykowski) Christensen (BSE '06) and her husband, Joe, welcomed their second son on April 23, Noah Douglas. Big brother, Lucas, loves his baby brother and enjoys helping take care of him.

Philip Dooley (BSE '02, MD '07) has been named program director of the University of Kansas School of Medicine-Wichita Family Medicine Residency at Via Christi. He and his wife, Joia, have lived in Wichita with their three children since July 2014.

Jennifer (Brand) Henning (PhD '03) has recently received a promotion to engineering supervisor. She will be responsible for her team and business development to support their client, NextEra Energy, at the northern three of their five nuclear energy sites. She will also be relocating from metro Atlanta to the Washington, D.C. area.



Since graduating in 2003, **Tawnya Sowerwine** has worked as a quality or process engineer in various manufacturing environments; from die-casting

to food and beverage to automotive hose production and has recently found a home in medical device and laboratory equipment at Thermo Fisher Scientific (TFS). She and her husband have relocated from Madison, WI to Asheville, NC, where they spend a lot of time hiking in the mountains, visiting local breweries with friends, and vegetable gardening.



Ali Mohraz (PhD '04) spent a four-month sabbatical in Barcelona, Spain, where he enjoyed amazing food and went to exciting soccer games at

the Camp Nou. He also reunited with **Chris Lorenz** (BSE '97, PhD '02) during a visit to King's College London, where Dr. Lorenz (at left in photo) is doing cutting edge research, teaching, and looking like a physicist.



Bob Morgan (BSE '04) is now in his 12th year with L'Oréal, where he has held various positions within operations including manufacturing, supply chain,

and purchasing. He is now the director of purchasing and is responsible for the integration of new acquisitions. After eight years in New Jersey, he had the opportunity to move back to the Midwest in 2015 and now lives in the Cleveland area with his wife, Katie-Lynn, and their two children, Henry (4) and Emily (1).



Karen Andrews (BSE '05) is an operations leader at Dow Chemical, working in Houston, TX. She and husband, Greg, welcomed their son,

Christopher, on September 12, 2015.

Mike Szoke (BSE '05) and his wife, Abby, welcomed their second child, Olivia, last September. Mike resides in Portage, Michigan and works for Allnex, where he is the site manager of a 70 Mlbs methylated amino resins plant in Kalamazoo.

Stephanie (Fraley) Goodell (BSE '07) recently joined General Motors as a senior analyst. Stephanie lives in her hometown of St. Clair, MI with her husband, Justin, and their two children, Evelyn (3) and Carter (1).

Sarah Ledford (BSE ChE '09), now Sarah Targosz, was married in December 2014 and recently moved to the Dallas-Ft. Worth area from Michigan. She is the owner of SLK Company, LLC, a government affairs, IT, and political consulting firm and is an activist for sustainable electronics and CFL bulb recycling, particularly safe toxic chemicals disposal.

Drew Ross (BSE '09) was married to Tiffany Pong (IS&A '08) on July 25th, 2015 in northern California. They reside in the Berkeley, CA, where Drew works to improve

the state of food process technology.

Ted Farrand (BSE '10) is a first year medical student at UC San Diego. He hasn't decided which specialty he wants to go into yet.



On May 13, **Alexander "Alec" Harris** (BSE '10) graduated from medical school. He will spend a year as an intern at Michigan State University on the

Grand Rapids campus before he heads out to do his residency in radiation oncology at Loyola University in Chicago.

Jessica Ho (BSE '10) and Galen Kragas were married on April 9, 2016. They currently reside in Houston, where they both work for Shell Oil.

Stephanus "Oscar" Oscar (ChE '10) lives in Indonesia and works for a data center company. He is getting married in September 2016.



Reggie Rogers (PhD '10) has been on the tenure-track as an assistant professor at Rochester Institute of Technology (RIT) since 2012. He received the

2015 James N. Cannon Award in Chemical Engineering from the National Organization for the Professional Advancement of Black Chemists and Chemical Engineers. Last spring, he was selected as the 2016 Richard and Virginia Eisenhart Provost's Award winner for Excellence in Teaching. This award highlights the teaching and leadership of one tenure-track faculty member on RIT's campus.

After working for Intel Corp. in Arizona for about three years, **Avi Wolf** (BSE '12), relocated to the East Coast to begin graduate school at Princeton University. He has just completed his first year of doctoral studies in the Tissue Morphodynamics Laboratory, advised by Professor Celeste Nelson from the Department of Chemical & Biological Engineering.



Danielle Mai (BSE '11) married Jonathan San (BSE ME '10) in October 2015 and held the reception at Michigan Stadium! Danielle also

recently completed a PhD from the University of Illinois and will begin conducting postdoctoral research at MIT this fall.

Ted Zaroff III (MSE '12) accepted a new job in technical services with Epic Systems, a healthcare software company.

Meredith Citkowski (BSE '13) was a finalist in Ford's brand-new 30 Under 30 program. It's an opportunity for her to enroll in a 'hands-on' course in leadership/community engagement, learning about corporate/non-profit relationships, and helping partnering non-profits assess and strengthen their current operations.

Betsy Gast (BSE '13) recently graduated from Wayne State University with her master's in chemical engineering from the Process Engineering and Project Management Program. She is moving to Davenport, IA to start her career with Nestle Purina PetCare as a production management trainee.

Eric Robbins (BSE '13) is an improvement engineer at Dow Chemical in New Orleans.



Ryan Moody (BSE '14) and fellow 2014 ChE alumna, **Liz Lippie**, travelled around Hawaii, where Liz, as a former ROTC member, has been stationed since

graduation. Liz is off to Nuclear Power School with the Navy and Ryan will be backpacking in South America before she joins Shell on an oil platform somewhere near the Gulf of Mexico.

Meet the 2015-2016 Chemical Engineering Alumni Board

Christopher Jones, BSE '95

**Anshuman Roy, MSE '02,
PhD '06**

Jessica Mattis, BSE '04 *

Sid Sapakie, BSE '67

**Kimberly McCall-Chaffin,
BSE '92, MSE '95 ***

Scott Siegmund, BSE '79

**Deborah Mielewski, BSE '86,
MSE '93 PhD '98**

**Rosemarie Wesson-Williams,
MSE '85 PhD '88**

Tahmid Mizan, PhD '96

William Wulfsohn, BSE '84

Gregory Rorrer, BSE '83

Joel Young, BSE '98

*** new members**

(Only U-M degrees listed)

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The University of Michigan was born in 1817 as an intellectual concept conceived out of a friendship between President Thomas Jefferson and the man he appointed as the first judge of the Michigan Territory, Augustus Woodward. Jefferson also supported the ideals of the Rev. Gabriel Richard, a Catholic priest who believed in educating Native American children and who, like Woodward, was instrumental in founding the University.

The bicentennial will be celebrated in calendar year 2017. In 2015, President Mark Schlissel said, "The University of Michigan holds a special place in American higher education, and the bicentennial affords us the opportunity to celebrate our collective achievements while also examining the complex challenges facing today's academy."

Please visit: bicentennial.umich.edu for more information

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