Hajim School of Engineering and Applied Sciences Presents

DESIGN DAY 2018

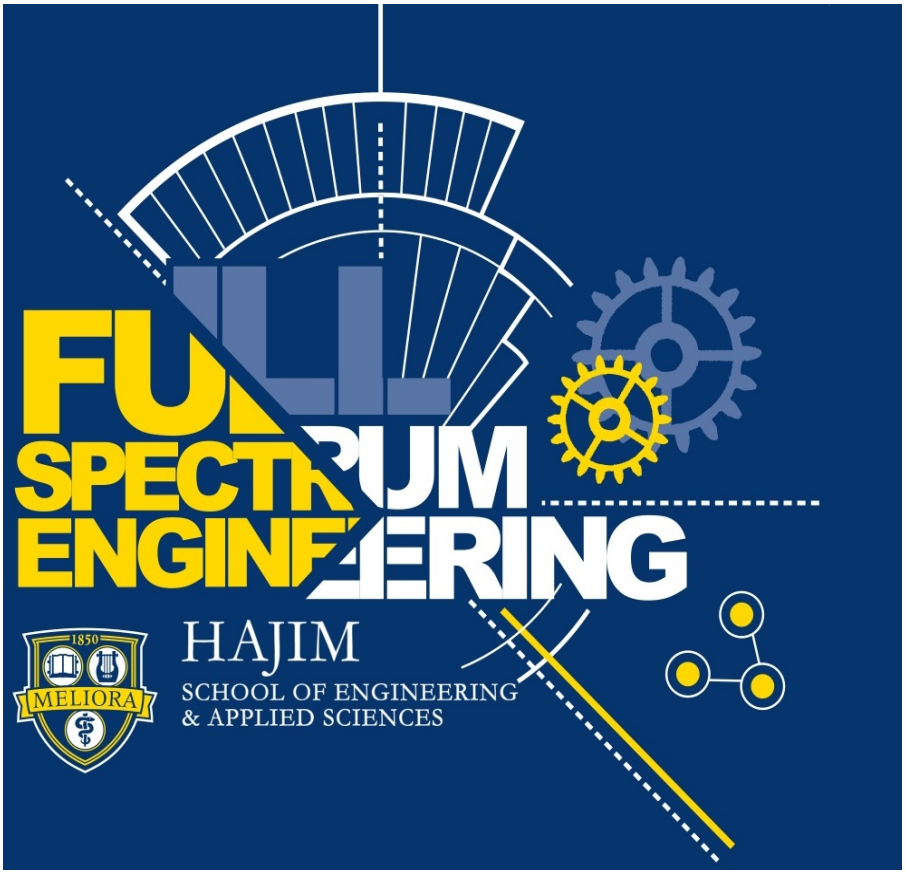
Friday, May 4th 2018
Goergen Athletic Center

Welcoming Remarks, Acknowledgements
Senior Design Exhibits Open
10:30 am

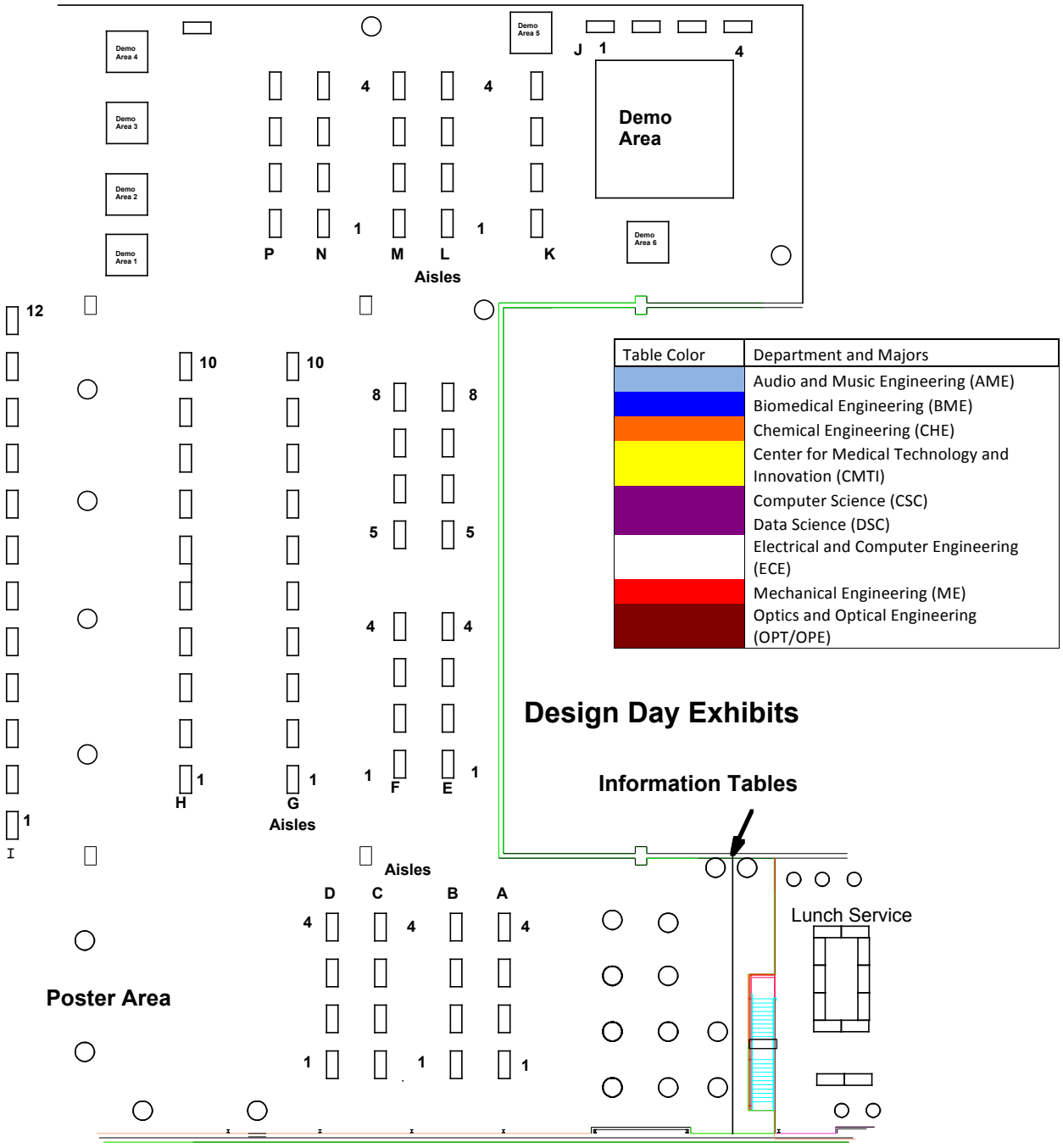
Dottie Welch Award Presentation
11:30 am

Lunch Service
11:30am-1:00pm

Design Day Concludes
1:30 pm



DISPLAYING DESIGNS ACROSS THE FULL SPECTRUM OF ENGINEERING AND APPLIED SCIENCE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Poster Area
Table Color
Department and Majors
Audio and Music Engineering (AME)
Biomedical Engineering (BME)
Chemical Engineering (CHE)
Center for Medical Technology and Innovation (CMTI)
Computer Science (CSC)
Data Science (DSC)
Electrical and Computer Engineering (ECE)
Mechanical Engineering (ME)
Optics and Optical Engineering (OPT/OPE)
Design Day Exhibits
Information Tables
Lunch Service

AME	Location	**Flat Panel Guitar Amplifier**	
	G10	A flat-panel speaker, otherwise known as a distributed mode loudspeaker (DML), is a speaker where specifically placed drivers distribute vibrations across the panel in modes in order to produce sound. This technology will be employed in a guitar amplifier.	
		Team Members:	Jillian Donahue
		Supervisor(s):	Professor David Anderson
		Customer(s):	

AME	Location	**Harmony Synthesizer**	
	L3	This project is a real time polyphonic pitchshifter which allows the user to add various harmonies to a live input signal.	
		Team Members:	David Kunstmann, Alin Kenworthy
		Supervisor(s):	Professor David Anderson
		Customer(s):	

AME	Location	**Indoor Auditory Masking System**	
	H7	We built an indoor noise masking system based on the theory of auditory masking. The system will be able to identify the different kinds of indoor noises and generate effective masking tone to mask out the noise and provide a relatively quiet indoor environment.	
		Team Members:	Anzhi Li, Yang Lu
		Supervisor(s):	Professor David Anderson
		Customer(s):	

AME	Location	**iOS Beat Generator**	
	N3	Developed an algorithm that utilizes beat tracking and pitch detection to generate a hip hop beat out of a recorded sample.	
		Team Members:	Steven Belitzky, Christopher Palace, Albert Peyton
		Supervisor(s):	Professor David Anderson
		Customer(s):	

AME	Location	**Midi Controller with Touch Interface and Pressure Sensitivity**	
	G10	A pressure sensitive midi controller with 96 keys, that triggers notes by skin conduction between two copper pads	
		Team Members:	Juan Estrella
		Supervisor(s):	Professor David Anderson
		Customer(s):	

AME	Location	**Retractable Ultrathin Schroeder Diffuser**	
	C3	This project aims to create two sound diffusers based around two troubled frequencies in a music practice room on campus. It follows a relatively new ultrathin model to liven sound in the room	
		Team Members:	Sam Mullen, David Chavera
		Supervisor(s):	Professor David Anderson
		Customer(s):	

AME	Location	**Sound Deceleration and Acoustic Absorption Towards Building a "Flute Mute"**	
	G5	With the goal towards creating a prototype that helps lower the volume of flute playing for practice and orchestral purposes, my project focused on implementing ways to decelerate and absorb sound waves in the flute headjoint (the primary audio source of the flute). Various designs were made to analyze how wall thickness and helical designs affected acoustic absorption and sound deceleration respectively using CAD software program "Siemens NX". The sound level results from each note of the chromatic scale using the final four designs were measured using an SPL meter.	
		Team Members:	Ayumi Yuasa
		Supervisor(s):	Professor David Anderson, Dan Phinney (AME/ECE Senior Design Advisor), Jim Butler (LLE)
		Customer(s):	

AME	Location	**Voice-activated Speaker**	
	G5	Voice control is becoming a prominent feature in many modern products and applications, and controlling a speaker with your speech is just one of these applications. This device captures audio data, analyzes its features, and determines what keyword was spoken with a neural network.	
		Team Members:	Isaac Mosebrook
		Supervisor(s):	Professor David Anderson
		Customer(s):	

BME	Location	**Advancement of Breast Pump Accessibility**	
	C4	Working towards improving access to breastfeeding education and resources for mothers of infants in the neonatal intensive care unit.	
		Team Members:	Renee Brigham, Katelyn Offerdahl, Helen Yang and Rachel Larkin
		Supervisor(s):	Professor Anne Luebke
		Customer(s):	Dr. Casey Rosen-Carole, Pediatrics, URMC, Breast Milk Management

BME	Location	**C-Arm X-Ray Improvements in the OR**	
	E1	Improved C-Arm X-Ray machines for neurosurgeries.	
		Team Members:	Shuang Grace Chang, Harshita Narang, Chi Huang, Emily Grey
		Supervisor(s):	Professor John-Hoon Nam
		Customer(s):	Dr. Yan Michael Li, Department of Neurosurgery & Oncology, URMC

BME	Location	**Dia-Beat-It**	
	F3	A point of care screening device for type 2 diabetes.	
		Team Members:	Matt Boulanger, Sue Zhang, Fredella Lee, Jack Hayden
		Supervisor(s):	Professor Ed Brown
		Customer(s):	Dr. Tim Dye, Obstetrics and Gynecology, URMC

BME	Location	**Diffuse Optics Team**	
	G9	A system to apply diffuse optical imaging to monitor fracture healing in the foot.	
		Team Members:	Hunsak (Stefan) Ha, Shenglin Liu, Ziping Liu
		Supervisor(s):	Professor Hani Awad
		Customer(s):	Professor Regine Choe

BME	Location	**Early Mobility for Kids**	
		The creation of an early mobility system for children with developmental disabilities.	
	H9	Team Members:	Joseph Cappotelli, Daniel Myers, Hyun (Jennifer) Choi, Devon Foggio
		Supervisor(s):	Professor Mark Buckely
		Customer(s):	Leah Talbot, PT, PCS, Roosevelt Children's Hospital

BME	Location	**Guiding US IV**	
		A device to aid in the Ultrasound IV insertion process in an emergency room setting	
	E5	Team Members:	Veronica Valencerina, Kwasi Nimako, Kate Bushway, Anisha Khosla
		Supervisor(s):	Professor Steve McAleavey
		Customer(s):	Michael Bux, URMC, MD Candidate

BME	Location	**IV Easy**	
		To assist nurses and reduce human errors by hospital bedsides related to IV tube connections.	
	N2	Team Members:	Hong Chen, Julia Herman, Hyunwoo Kim
		Supervisor(s):	Professor Laurel H. Carney
		Customer(s):	Karen Fellows, Senior Principal Systems Engineer, Baxter Healthcare Corporation

BME	Location	**Moh's Surgery Teaching Tool**	
		A device for dermatology residents to practice planning facial skin reconstruction.	
	I3	Team Members:	Ryan Bowen, Mackenzie Harris, Jason Kim
		Supervisor(s):	Professor Amy Lerner
		Customer(s):	Dr. Bill Sipprell and Jason Mathis, Dermatology, URMC

BME	Location	**OR Communication**	
		A device or system that will be used to aid surgeons with various hearing abilities while operating on patients.	
	M3	Team Members:	Anna Hrbac, Christian Keenan, Jake Krapf, Anyah Wright
		Supervisor(s):	Professor Ed Lalor
		Customer(s):	Ian DeAndrea-Lazarus, URMC

BME	Location	**Plasma Separation Team**	
		Designing a system to separate plasma from whole blood patient samples in less time than centrifugation for Ortho Clinical Diagnostics.	
	E6	Team Members:	Eva (Mollie) Hansen, MaryAnne Achieng, Huy Nguyen, Xuan (Monica) Sun
		Supervisor(s):	Dean Johnson, Ph.D.
		Customer(s):	Andrew Kirsch, Ortho Clinical Diagnostics

BME	Location	**Polymer Surface Modification to augment VITROS® MicroWell Technology**	
		Polymer to enhance capture molecule binding on MicroWell surface for increased assay sensitivity.	
	E7	Team Members:	Alessandro Del Priore, Jingyi Lori Fan, Geoffrey Rouin
		Supervisor(s):	Professor Kanika Vats
		Customer(s):	Andrew Kirsch, Department of Program Management, Ortho Clinical Diagnostics

BME	Location	**Saccadic Adaptation**	
		A Saccadic Adaptation task that can be done at home.	
	I5	Team Members:	Nicholas Boldt, Daniela Burnes Vargas, Emily Palacio, Sang Curtis Park
		Supervisor(s):	Professor Anne Luebke
		Customer(s):	Dr. Ed Freedman, Department of Neurosciences, URMC

BME	Location	**TB Skin Deep**	
		Developing an improved method of diagnosing TB using PPD.	
	G7	Team Members:	Raymond Chin, Tianyu (Gary) Wu, Anli Lin, Alexander Strand
		Supervisor(s):	Professor Regine Choe
		Customer(s):	Dr. Arnulfo Torres, Rochester TB Clinic

BME	Location	**The Listen'Ears**	
		Using modern technology to analyze brain-ear interfaces to help you listen to what really matters	
	I7	Team Members:	Arushi Jain, Jacques Kouevi, Jeremy Deniega, Salah Mahmoudi
		Supervisor(s):	Professor Ross Maddox
		Customer(s):	Sridhar Kalluri, Ph.D., Researcher at The Starkey Hearing Research Center

BME	Location	**The ThighCyclers**	
		An accessory device for adaptive cycles to promote safer, more comfortable rides for individuals with leg weakness due to Stroke, TBI or other medical conditions.	
	K1	Team Members:	Erik Backstrom, Kelly Tighe, Kyle Ruffner, Iain Wright
		Supervisor(s):	Professor Catherine Kuo
		Customer(s):	Anita O'Brien, Executive Director, Rochester Accessible Adventures

BME	Location	**TouchStream Seizure Detection**	
		The design of an algorithm capable of detecting seizure onset, duration, and severity.	
	C1	Team Members:	Icxel Valeriano, Hetince Zhao, Jingxia He, Michiko Feehan
		Supervisor(s):	Professor Diane Dalecki
		Customer(s):	Joel Benzel, CEO & Founder, Touchstream

BME	Location	**TubercAlert!**	
		To monitor areas at high risk of spreading tuberculosis bacteria, our device detects the concentration of airborne tuberculosis, thus indicating locations where attention should be directed.	
	G4	Team Members:	Ramel Morales, Sam Kann, Corrine Kennedy, Andrew Holloman
		Supervisor(s):	Professor James McGrath
		Customer(s):	Dr. Arnulfo Torres, Rochester TB Clinic

BME	Location	**Wheelchair Improvements**	
		Create a mechanism to enable wheelchair users improved ability to access their belongings.	
	H1	Team Members:	Hye Mi Abby Kim, Harrah Newman, Zijie James Sha, Alexandra Wolkoff, Michael Zhang
		Supervisor(s):	Professor Scott Seidman
		Customer(s):	Jennifer Lowell, Lifetime Assistance

CHE	Location	**Design of Sublimation Procedures for OLED Chemicals**	
	D2	Team Gouda designed a scale-up protocol to allow the company, Molecular Glasses, to achieve more affordable and effective organic light-emitting diodes (OLED) purification via train sublimation. The validity of applying the Langmuir Evaporation Model to the sublimation of solids was tested using the two model compounds—anthracene and tri-p-tolylamine—that are widely used in OLED fabrication. Based on the team's experimental results, it was determined that the model works for both solid model compounds when a correction factor is taken into account.	
		Team Members:	Rui Gao, Hyojeong (Annie) Lee, John Kim, Rafael Muchanga, Jr.
		Supervisor(s):	Mark Juba, Molecular Glasses and CHE Department
		Customer(s):	Mark Juba, Molecular Glasses

CHE	Location	**Factors Influencing the Injection Molding of Isoplast® 302 EZ Resin**	
	I1	Harbec Inc. uses Lubrizol Isoplast® 302 EZ resin to extrude into fuel filter caps, but noticed that some batches had higher rejection rates than others. Our charge was to find a way to differentiate "good" and "bad" lots of resin prior to drying and extrusion. Through a series of tests, we were able to produce the promising results that the "good" resin may contain more elemental tin, which could act as a stabilizer that reduces the lot's rejection rate, in addition to the fact that COA analysis showed that there is a correlation between melt flow rate and rejection rate.	
		Team Members:	Seth Edwards, Claire Evans, Collin Larkin, Amelia Moriarity
		Supervisor(s):	John Hoefen, Harbec Inc. and Professor Doug Kelley
		Customer(s):	John Hoefen, Harbec Inc.

CHE	Location	**Investigation of Oxygen Mass Transfer Rate in Viscous Fluids**	
	I10	Understanding oxygen mass transfer rate (OTR) is an essential concept in the mixing industry. SPXFlow is interested in knowing the viability of the Excess Sulfite Method in determining the OTR in highly viscous fluids as such corn syrup. The team found that though the method was efficient in water, it was limited in corn syrup, and alternative approaches were suggested.	
		Team Members:	Mohammad Almagweshi, Jordan Mukisa, Weijing (Penny) Xu, Yang (Sophie) Xue
		Supervisor(s):	Mr. Kevin Logsdon, SPXFlow and Professor David Foster
		Customer(s):	Mr. Kevin Logsdon, SPXFlow

CHE	Location	**Laboratory-Scale Reaction Injection Molding of a Shape Memory Polymer**	
	F2	A proposed method of producing shape memory polymers is reaction injection molding (RIM), a manufacturing process in which liquid reagents are injected into a mold where a curing reaction takes place forming thermosetting polymer. After an assessment of the RIM machine revealed safety concerns and damaged equipment, the safety concerns were mitigated and much of the damaged equipment replaced. Heating experiment controlled by our own LabVIEW code were conducted, and suggestions were made on how modify the current set up to make it more suitable for the desired RIM process.	
		Team Members:	Gabrielle Dimoff, Akif Hosain, Monica Perrone, Greg Sheppard
		Supervisor(s):	Professor Mitchell Anthamatten, Professor Doug Kelley and Cindy Fitzgerald
		Customer(s):	Professor Mitchell Anthamatten, CHE Department

CHE	Location	**Maintenance Control and Testing of Legionella in Cooling Towers**	
	H6	This project involved collaboration with Harbec, Inc. to evaluate the efficacy of implementing a UV filtration system to eliminate bacteria by modeling their cooling tower system. The mock filtration system built used Genesee River water and the quantity of bacteria was evaluated using dip slides. It was determined that UV filtration reduced the quantity of total bacteria in water when compared to a control.	
		Team Members:	Austin Abel, Joseph Frevele, Anna Kopp, Marina Morrow, Johanna Marie Oasan
		Supervisor(s):	Jeff Eisenhauer, Harbec, Inc. and Rachel Monfredo, CHE Department
		Customer(s):	Jeff Eisenhauer, Harbec,Inc.

CHE	Location	**Making the Unsteady State Mixing Problem a Reality**	
	P2	Team Romano designed and constructed a lab module for use in the University of Rochester Chemical Engineering Department. The unsteady-state salt mixing lab is designed to demonstrate a common Fluid Dynamics mixing problem. This hands on experience aims to help with a fundamental understanding of a conceptually challenging problem.	
		Team Members:	Luke Dengler, Dominic Giambra, Sarah Lanzafame, Haley Miyaoka
		Supervisor(s):	Prof. David Foster, CHE Department
		Customer(s):	Prof. David Foster, CHE Department for use in Fluid Dynamics

CHE	Location	**Mandrel-In-Motion**	
	M4	This project sought to help ORAFOL improve the uniformity of their electroformed reflective materials and subsequently reduce their required grinding time. Trials were conducted to test the "Mandrel-in-Motion" theory, which hypothesizes that movement of the mandrel during the electroforming process will sufficiently disturb the ion transfer by rapidly changing the electric field lines, resulting in a more uniform thickness. The project involved meaningful design of experiments, characterization of a motor and rotating arm system, and methods to estimate fluid velocity.	
		Team Members:	Alessandra Sauro, Alexander Kaufman, Emily Volk, Tae Ryoo
		Supervisor(s):	Mr. Eric Janosko, ORAFOL Presision Technology Solutions, and Rachel Monfredo
		Customer(s):	Mr. Eric Janosko, ORAFOL Presision Technology Solutions

CHE	Location	**Molding of Integrated Biochar and Polymer using an Injection Molder**	
	F7	Optimal conditions were sought to mold softwood Biochar with different polymers such as polypropylene, high-density polyethylene, low-density polyethylene and polystyrene crystal using Morgan Press G-100T heat injection molder. Mechanical testing of Biochar-polymer composites (hardness, tensile, fracture surface and cross sectional area) was performed to analyze the material properties for each sample. Results showed no trend for hardness and tensile testing.	
		Team Members:	Seung Hun (Kevin) Jung, Zongru (Lee) Li, Venice Magunga, Solange Munezero
		Supervisor(s):	Kathleen Draper, Biochar Journal and Cindy Fitzgerald, CHE Department
		Customer(s):	Kathleen Draper, Biochar Journal

CHE	Location	**Optimization and Characterization of Biochar-Polystyrene Composite**	
	I9	The objective was to optimize a process for creating a composite of Biochar and expanded polystyrene for use as a building material in developing countries. Improvements made to the original process included a solvent change, Biochar grinding and sieving automation, and a vacuum pump addition to degas samples. It was observed that samples contained void spaces, were hydrophilic, and that increasing toluene concentration both lowered a sample's glass transition temperature and decreased mechanical strength –important characteristics when deciding on potential applications.	
		Team Members:	Charlotte Berg, Callum Breene, Nisha Divan, Benjamin Gleed
		Supervisor(s):	Kathleen Draper, Biochar Journal and Rachel Monfredo
		Customer(s):	Kathleen Draper, Biochar Journal

CHE	Location	**OROFOL Wastewater Treatment Process Characterization**	
	I11	A lab scale model was developed to study parameters affecting the ORAFOL wastewater treatment process. Trends were observed with pH, flocculent, and reagent concentrations on nickel concentration in treated water. SEM and FTIR also demonstrated differences in precipitate composition and structure.	
		Team Members:	Alexander DiPerna, Janson Ho, Devin Sonne, Michelle Trojan
		Supervisor(s):	Mr. Eric Janosko, ORAFOL Presision Technology Solutions, and Cindy Fitzgerald
		Customer(s):	Mr. Eric Janosko, ORAFOL Presision Technology Solutions

CHE	Location	**Process Control with Significant Time Delays**	
	I6	A system was built which has significant time delays in response measurement to study the efficacy of using the Smith Predictor to compensate for the time delay in controlling a process. A mathematical model that simulates the actual process was derived from analyzing the response data. The Smith Predictor was programed in LabVIEW with a PID controller and then tuned to optimize system stability.	
		Team Members:	Saifeddin Abdalrahman, Mengyi (Crystal) Lei, Yifei (Susie) Yan, Yuxuan (Dan) Zhu
		Supervisor(s):	Professor Eldred Chimowitz and Professor Doug Kelley
		Customer(s):	ChE Undergraduate Lab

CHE	Location	**REASSEMBLY AND ANALYSIS OF CONTINUOUS-FLOW BIOCHAR RETORT**	
	M1	A prototype for a small-scale continuous-flow Biochar retort was reassembled and tested. The retort, designed by Andrew Wells, takes wood chips and converts them into Biochar via a pyrolysis process at temperatures exceeding 350 Celsius. The project aimed to reassemble, run, and characterize the reactor, in order to improve its efficiency in the production of Biochar.	
		Team Members:	Tomotaka Endo, Julie Hartman, Unni Kurumbail, Amelia Petrosino
		Supervisor(s):	Andrew Wells, Acorn Biochar and Mark Juba
		Customer(s):	Andrew Wells, Acorn Biochar

CHE	Location	**REDUCING BIOLOGICAL OXYGEN DEMAND IN ORAFOL'S WASTEWATER**	
	I8	Team Limburger worked to reduce the biological oxygen demand in Orafol's wastewater due to its negative effects on the environment and the surcharge from Monroe County. This included testing two types of treatments- biological and chemical. Weekly biological oxygen demand and chemical oxygen demand were run, and showed significant promise that merit future study of both the biological and chemical treatment options.	
		Team Members:	Charlotte Caldwell, Chiamaka Alozie, Ellison Entier, Mark Sweeney
		Supervisor(s):	Mr. Eric Janosko, ORAFOL Presision Technology Solutions, and Rachel Monfredo
		Customer(s):	Mr. Eric Janosko, ORAFOL Presision Technology Solutions

CHE	Location	**Temperature and Humidity Control System for Characterization of a Fuel Cell**	
	H2	A new 4-cell fuel cell was assembled and a temperature and humidity controlled chamber was designed, manufactured, and controlled to enable CHE lab students to examine these effects on a fuel cell's performance. Temperature is controlled with both a Peltier-cooling module and two cartridge heaters. A solenoid valve inputting either dry or humidified air regulates the relative humidity. Using proportional-integral feedback control for the heaters and cooler, temperature is controlled between 20 and 60˚C within ±0.2˚ C, and relative humidity between 20 and 60% within ±1%.	
		Team Members:	Andrew Golembeski, Haberly Kahn, Ariel Lighty, Nola Yang
		Supervisor(s):	Thor Olsen and Cindy Fitzgerald
		Customer(s):	CHE Department Undergraduate Lab

CHE	Location	**Water Recycling Designs For Guardian Glass**	
	I4	Team FETA worked with Guardian Glass in Geneva, NY aiming to recycle at least 50% of the wastewater from their water system. Thorough analysis including water system investigation, wastewater testing, and cost analysis were conducted. The team proposed three designs with recovery rates higher than 50% with reasonable payback periods as well as suggestions for future work.	
		Team Members:	Nawaf Alhowaish, Yijin Li, Guansu (Francis) Niu, Yixuan (Stefan) Zhang
		Supervisor(s):	Corey Rapp, Guardian Industries and Mark Juba
		Customer(s):	Corey Rapp and Michael Watters, Guardian Industries

CMTI	Location	**Aortic Wall Exposure**	
	A2	Our device will be used during minimally invasive aortic valve replacement surgeries to aid in the exposure of the aortic valve tissue area and allows for easier implantation of the replacement valve. This improvement will make performing minimally invasive surgeries more accessible to surgeons.	
		Team Members:	Connor McBride, Emily Newman, Josh Schum-Houck
		Supervisor(s):	Professor Greg Gdowski, Professor Amy Lerner; Martin Gira, Senior Research Engineer, URMC
		Customer(s):	Dr. Spencer Rosero, Dr. Peter Knight and Dr. Bryan Barrus, Cardiovascular, URMC

CMTI	Location	**CompreSure's Compressive Intramedullary Rod (CIMR) System**	
	A1	A new implant that allows for minimally invasive fracture fixation and compression of breaks located in the humerus. Our novel technology utilizes controlled compression of the fracture site to promote faster and stronger bone healing, which leads to improved patient recovery.	
		Team Members:	Alyssa Lopez, Gregory Dadourian, Meghann Meyer
		Supervisor(s):	Professor Greg Gdowski, Professor Amy Lerner; Martin Gira, Senior Research Engineer, URMC
		Customer(s):	Dr. John Gorczyca and Dr. Dave Ciufo, Orthopaedics, URMC

CMTI	Location	**Dural Safe Bone Removal**	
	A3	A way to enable the surgeon to use both hands on the Kerrison Rongeur while simultaneously cutting, removing and collecting targeted bone segment during lumbar decompressions in order for the surgeon to safely and effectively carry out the procedure.	
		Team Members:	Amanda Smith, Evan Sosnow, Rebecca Amorese
		Supervisor(s):	Professor Greg Gdowski, Professor Amy Lerner; Martin Gira, Senior Research Engineer, URMC
		Customer(s):	Dr. Addisu Mesfin and Dr. John Gorczyca, Orthopaedics, URMC

CMTI	Location	**Improving Radiation Safety for Surgical Staff and Operators**	
	B4	A way to improve radiation safety protection during endovascular procedures in order to reduce harmful and unnecessary radiation exposure.	
		Team Members:	James Melton, Justin Schumacher, Raiem Smith
		Supervisor(s):	Professor Greg Gdowski, Professor Amy Lerner; Martin Gira, Senior Research Engineer, URMC
		Customer(s):	Dr. Michal Stoner, Vascular Surgery; Dr. Spencer Rosero and Mr. Adam Doyle, Cardiology, URMC

CMTI	Location	**Quick and Repeatable Ultrasound Imaging during CPR**	
	A4	A way to reduce the time needed to find the right ultrasound image in cardiac arrest patients, in order to minimize the time that the patient's brain is not receiving oxygenated blood.	
		Team Members:	Eric Ravinal and Vladimir Tokarchuk
		Supervisor(s):	Professor Greg Gdowski, Professor Amy Lerner; Martin Gira, Senior Research Engineer, URMC
		Customer(s):	Dr. Lu, Dr, Miglani and Dr. O'Connor, Emergency Medicine; Dr. Spencer Rosero, Cardiology, URMC

CSC	Location	**Blob-bot: A Robotic Amoeba**	
	K2	We present the design, construction and control of a novel robot platform consisting of a flexible icosahedral shell animated by 30 linear actuators co-incident with the polyhedral edges.	
		Team Members:	The students of CSC 230, "Robot Construction"
		Supervisor(s):	Professor Randal Nelson
		Customer(s):	

DSC	Location	**Data Science Capstone Project**	
	B3	Founded in 1971, Paychex is committed to providing payroll, human resource and benefits outsourcing services for small- to medium-sized business and it has become one of the largest provider of HR services supporting more than 1 million worksite employees. To develop marketing strategies that enable the company to better target potential customers and recommend products more efficiently, we implemented statistical methods and discovered correlation relationships among products in the PayChex transactional records.	
		Team Members:	Fuya Xu, Yadong Wei, Yuxuan Cui, Zihan Qi
		Supervisor(s):	Professor Ajay Anand
		Customer(s):	PayChex

ECE	Location	**Active Music Tracking**	
	P1	Sensor network that tracks movement between rooms and adjusts audio volumes accordingly to give the consumer a consistent listening experience in a multi-room environment.	
		Team Members:	Riley Phelps, Nicholas Weinstein, Adam Stenson
		Supervisor(s):	Professor Jack Mottley
		Customer(s):	

ECE	Location	**Controlled Labyrinth**	
	B2	Controlled labyrinth is a platform to balance a metal ball using servo control. By rotating the labyrinth platform, the ball is able to move on the platform without human interaction. The iphone app allow user to take picture of a hand-painted labyrinth, and it has the power to compute the solution and demo route on the platform automatically.	
		Team Members:	Yukun Chen, Wentao Hu, Zixiang Liu, Zhongyuan Lu
		Supervisor(s):	Professor Victor V. Derefinko, Professor Jack Mottley
		Customer(s):	

ECE	Location	**Drone Drop System**	
	J1	Demonstration of a drop system for multiple drones.	
		Team Members:	Brian Baker, Zuo Wang
		Supervisor(s):	Professor Jack Mottley
		Customer(s):	Army Cyber Institute

ECE	Location	**Location Finding in a GPS Denied Setting**	
	H3	Using three or more WiFi routers, an absolute location can be calculated by using RSSI readings from the access points.	
		Team Members:	Andrew Brownlee, Arlen Fan, Maxwell Gates, Fiyinfoluwa Oluyinka
		Supervisor(s):	Professor Jack Mottley, Professor Victor Derefinko
		Customer(s):	

ECE	Location	**Low Power Server**	
	E4	We have designed and assessed the feasibility of a low power server that can display a website page within minimal latency (1-10 seconds) of a standard web server. Due to the complexity and time constraints, we have created designs for the motherboard, toolchain for the custom processor, and simulated programs of necessary drivers. The motherboard is ready to be sent for first prototypes, and the assembler and linker function flawlessly. The simulator runs Fusion-Core executable ELF files, with a proper memory view and register dump of the running program.	
		Team Members:	Dylan Wadler, Sakhile Mathunjwa
		Supervisor(s):	Professor Dan Phinney, Professor Victor Derefinko, Professor Jack Mottley
		Customer(s):	

ECE	Location	**Magneto Glove**	
	F6	A glove with sensors designed to capture flex and motion to some degree and transmitted remotely to a host machine. This allows us get gestures to control functions on a computer such as games and music player.	
		Team Members:	Ahmad Alayesh, Abdul-Kudus Chiibu, Prosper Feya, Zachary Lyons
		Supervisor(s):	Professor Jack Mottley, Professor Victor Derefinko
		Customer(s):	

ECE	Location	**Relative Position Locator**	
	G1	A common issue among first responders is the inability to locate teammates in emergency situations (i.e. firefighter finding their partner in a burning building). Our project solves this problem, using a radio, trilateration calculations, RSSI values, and compass headings simultaneously to calculate the position of a teammate relative the the user. The first responder will be able to identify where the teammate is using an LED ring-- the location of the LED provides the direction of the teammate relative to you along with a color to identify approximate distance.	
		Team Members:	Abigail Eberts, Christopher Granata, Brianna Herron, Natalie Jara, Steffen Jensen
		Supervisor(s):	Professor Victor Derefinko, Professor Jack Mottley, Keith Kripp (Harris Engineer)
		Customer(s):	

ECE	Location	**Robotic Exploration and Mapping**	
	J4	This project seeks to autonomously explore a building or other unknown environment. An autonomous system based on the Robotis Turtlebot 3 was developed to explore and create a three dimensional map. The mapping uses a combination of LIDAR and stereo camera based sensors.	
		Team Members:	Amin Almozel, Harel Biggie, Steven Broida, Theodore (Teddy) Reiss
		Supervisor(s):	Professor Thomas Howard
		Customer(s):	

ECE	Location	**Self Parking Car**	
	P4	We are designing a car that will be able to autonomously park itself in a garage. The car is trained using a neural network to detect a path into the garage and is equipped with infrared sensors which are triggered by an object in the cars path and will bring the car to an halt. Once the object is no longer in the path, the car will proceed to park.	
		Team Members:	Mihiraan Singh, Rajat Kuthiala, Ryan Bhular
		Supervisor(s):	Professor Jack Mottley, Professor Victor Derefinko
		Customer(s):	

ECE	Location	**Smart Garage Parking System**	
	K3	Smart Garage Parking System aims to automatically park a car model into a two-space garage. By pressing a button, the user can choose which spot to park when the garage is entirely empty. Otherwise, the car will park into the empty spot if there is a car already inside.	
		Team Members:	Meixiao Han, Ruoxue Zhang, Junyi Shen, Yiming Yang
		Supervisor(s):	Professor Victor Derefinko, Professor Jack Mottley
		Customer(s):	Jose Salazar, Harris Corporation

ME	Location	**3D Tactile Map**	
	I2	Mary Cariola Children's Center provides evidence-based solutions in education and life skills development for children and youth with complex disabilities. We have developed a 3D tactile map focused on helping visually impaired students safely navigate the Mary Cariola campus.	
		Team Members:	Jane Fong, Kathryn LaBine, Nicholas Mitchell, Alexandra Nelligan
		Supervisor(s):	Professor Christopher Muir
		Customer(s):	Angela Mancini, Mary Cariola Children's Center

ME	Location	**Automatic Label Application of Biological Samples**	
	G3	The device for this project is intended to automate the process of peeling and applying labels printed on an 8.5" x 11" sheet of paper onto different sized bottles.	
		Team Members:	Oscar Hernandez, Michael Lawrie, Hunter Dell, Bradley Blazier
		Supervisor(s):	Bob Jones
		Customer(s):	Ortho Clinical Diagnostics

ME	Location	**Casting Capability at the University**	
	H5	The mechanical engineering department would like to acquire casting capabilities. In light of that, our design project encompasses the research and development necessary to create a lab which exposes students to casting and its applications.	
		Team Members:	Brian Lee, Jillian Silvestri, Dan Healey, Robert Nicholas
		Supervisor(s):	Professor Christopher Muir
		Customer(s):	Douglas Kelley, Mechanical Engineering, UR

ME	Location	**Construction Robotics Platform Support**	
	F4	The problem currently faced by Construction Robotics is the complicated design of the structure that supports the load of SAM the bricklaying robot as well as the workers alongside the robot. The task at hand is to design a beam that connects the tracks to the hydro mobile platform as simply as possible.	
		Team Members:	Ian Campbell, Caulin Forest Nelson-Angelsea, Chris Muller, Manuel Rodriguez
		Supervisor(s):	Professor Christopher Muir
		Customer(s):	Construction Robotics

ME	Location	**Design of an Accelerated Thermomechanical Tester for Shape Memory Polymers**	
	F1	A Shape Memory Polymer is a material that, once deformed, will revert back to its original shape after proper heating. Current research in the Mechanical Engineering department aims to understand the performance life of the material. The goal of the project is to create a device that will automate life testing by performing a minimum of 100 cycles of manipulation and reversion within a single eight hour period on multiple samples.	
		Team Members:	Jonathan Lloyd, David Meister, Mason Raboy, Yi Zeng
		Supervisor(s):	Professor Christopher Muir
		Customer(s):	Professor John Lambropoulos, UR

ME	Location	**Dorm Dash Delivery Container**	
	G6	Dorm Dash asked our team to design and manufacture a container to keep food warm and secure during deliveries. The box needed to fit in the front passenger seat of a compact sized sedan and have an easy access door for the driver to insert and remove food items. Another requirement was to prevent food and drink spills that could contaminate other orders. Lastly, the container needed to be easy to clean and non-toxic.	
		Team Members:	David Schatz-Mizrahi, Rony Colón, Clayton Harrington, Sam Pomerantz
		Supervisor(s):	Professor Christopher Muir, Ryan Smith, and Jim Alkins
		Customer(s):	Dorm Dash (Fangyuan Huang and Larry Chen)

ME	Location	**Engine Dynamometer**	
	N1	The deliverable of this project is an engine dynamometer, which will be used for the collection of torque data across the RPM range of a Briggs and Stratton Model 19 racing engine. This project presents an inertial-type dynamometer that determines the torque output of the engine by the angular acceleration of the rotating assembly extending from the output shaft. Rotational velocity data of the shaft is collected with a Hall-effect sensor and circuit combination. This data is then processed through LabView and MATLAB to produce a final torque versus RPM curve.	
		Team Members:	Eric Pinsker-Smith, Peter Miklavcic, Mohamed Keita, Yike Ling
		Supervisor(s):	Professor Christopher Muir, Professor Sheryl Gracewski
		Customer(s):	UR Baja SAE

ME	Location	**Human Powered Vehicle**	
	D4	This project involves the design, analysis, testing and manufacturing of a human powered vehicle (HPV). HPVs are aerodynamic vehicles, driven solely by human power, that use concepts from traditional bicycles to serve as efficient means of land transportation. HPVs focus on optimizing human strengths while compensating for human weaknesses. This year's vehicle was the first from the University of Rochester to be entered into the 2018 North East ASME HPV Competition with 50 teams representing both American and International universities.	
		Team Members:	Rahman Ejaz, Guanru Feng, Faisal Kamal, Zhongdi Liu, Rachel Olson, Thomas Kittross, Kedrick Sparks, Fernando Suarez, David VanderMeer
		Supervisor(s):	Professor Christopher Muir
		Customer(s):	Professor Douglas Kelley

ME	Location	**Manuscript Carrier**	
	E2	Historical manuscripts and maps are sensitive items that can sometimes be illegible due to damaging. Using multi-spectral imaging, the Lazarus Project re-images these items and make them readable again. To assist with this process, this project designed a mechanism to move the items in both the x and y direction during imaging without actually touching the items.	
		Team Members:	Jinge Wang, Alan Xu, Josue Hernandez, Patrick O'Sullivan, Anik Hoque
		Supervisor(s):	Professor Christopher Muir
		Customer(s):	Gregory Heyworth, UR Department of English

ME	Location	**Mechanical Components of a Safe Fluoroscopy Surgical Simulation**	
	E8	The group was tasked with creating the mechanical components of a c-arm for medical imaging. The c-arm is used for practicing fluoroscopy assisted surgery, without the use of radiation. A team of optical engineering students pursued a system that allows for imaging through an opaque medium with a Near-IR light source and several other optics. The mechanical engineering group was charged with creating a manually controlled device which mounts all optical components and allows the imaging system to move 30 degrees in two angular directions at certain increments.	
		Team Members:	Gina Bolanos, Ariana Cervantes, Ryan McEvoy, Devin Marino
		Supervisor(s):	Professor Christopher Muir, Professor Wayne Knox
		Customer(s):	Dr. Ahmed E. Ghazi; Katherine Armstrong, Joseph Kelly, Nora Lane, and Jeffrey Tsao, Optical Engineering Senior Design Group

ME	Location	**Micro Walking Device**	
	L4	The goal of this project is to create a completely autonomous robot using a foam body and coin motors for thrust and direction.	
		Team Members:	Michael Dong, Sean Boylan, Min A, Zach Westhoff
		Supervisor(s):	Professor Hesam Askari, Professor Jessica Shang
		Customer(s):	Professor Hesam Askari, Professor Jessica Shang

ME	Location	**Omnidirectional Wheelchair**	
	K4	The goal of this project is to create a highly maneuverable wheelchair that can move at angles and laterally independent of the heading of the user. This will allow wheelchair users to more easily perform day to day tasks.	
		Team Members:	Gilead Biggie, Jacob Erichson, Jacob Reichman, Alison Thaler, Rebecca Walton
		Supervisor(s):	Professor Christopher Muir
		Customer(s):	Thomas Howard

ME	Location	**Optic Scanner**	
	B1	A system was designed to align and rotate a 20 mm glass cube at 18,000 RPM for use in an optical metrology system.	
		Team Members:	Zi Hao Chen, Connor Kasper, Ivan Suminski, John Uchal
		Supervisor(s):	Professor Christopher Muir, Ryan Smith
		Customer(s):	Di Xu, Professor John Lambropoulos

ME	Location	**Positioning Stage Flexure Improvement for Omega Laser Targeting System**	
	H8	To counter irregular movement with a laser targeting positioning system, a piezoelectric actuation flexure was redesigned and manufactured. The new flexure system was compared to the traditional design to demonstrate improved bidirectional movement.	
		Team Members:	Dyreek Brathwaite, Benjamin Caccavale, Abdulmalik Kurdi, Meghan Patrick
		Supervisor(s):	Professor Christopher Muir, Jeffrey Ulreich (LLE)
		Customer(s):	Jeffrey Ulreich (LLE)

ME	Location	**Rotational Interface for LVDT Winding Machine Production**	
	L2	The solenoid LVDT winding machines at G.W. Lisk are subject to slip occurring in the clamps that hold stainless steel cores. The core is wound with a copper wire which applies a torque. The goal of this project is to design an improved rotational interface to hold the cores while preventing slippage.	
		Team Members:	Alexander Boyd, Elizabeth Stanitz, Christian Rivera, Andrew Fianu
		Supervisor(s):	Professor Christopher Muir
		Customer(s):	Kirk Peskor, G.W Lisk Company, Inc

ME	Location	**Team Harris**	
	H10	The purpose of this project is to build and analyze the locked-in strain of a simple truss structure with the ability to load and unload at least three separate masses at various locations. The masses added are required to cause significant deformation in order to measure changes in strain when loaded and unloaded in various patterns. The loading and unloading of the masses is required to be done both when the structure is upright and when it is flipped 180° in order to determine the locked-in strain.	
		Team Members:	Gabriela Alatorre, Leonardo Bonilla, Garret Dunn, Johann Ortiz-Franco
		Supervisor(s):	Leslie Johnson, Harris Corporation
		Customer(s):	

ME	Location	**Team OLED**	
	C2	OLED Works is a company that manufactures organic LED lighting. During their standard manufacturing process, they ran into the issue of contamination from atmospheric conditions while transferring the LEDs from one step in the process to the next. In order to solve this our team was tasked with designing a box that is vacuum sealed. The doors need to open themselves at a pressure differential(inside the box vs the outside) of 5 psi. The box must also withstand a pressure differential of 1 bar without permanent deformation.	
		Team Members:	Russell DiGate, Erik Rosenkranz, John Quinlivan, Jorge Garcia
		Supervisor(s):	Tim Spencer, OLED Works
		Customer(s):	

OPE	Location	**Analyzing Mid-Spatial Frequency (MSF) Error in Monolithic Freeform Telescopes**	
	E3	Mid-spatial frequency (MSF) figure errors are artifacts introduced to optical surfaces when performing sub-aperture grinding and polishing. For three monolithic freeform telescopes being fabricated at Optimax, we developed our own state-of-the-art model for analyzing the effect MSF errors have on optical performance. Empirical measurements have validated our model's accuracy and have allowed us to perform sensitivity analysis and tolerancing of the monolithic designs for MSF errors.	
		Team Members:	David Henry Lippman, Matthew Page, Woo Kim, Kevin Kuyk
		Supervisor(s):	Professor Jannick Rolland
		Customer(s):	Optimax Systems Inc.

OPE	Location	**Coherence Length Measurement Device**	
	M2	The goal of this project was to ensure the proper function of the multi-wavelength sources used by semiconductor manufacturers in their optical alignment sensors, by developing a coherence length measurement device. Our team has developed a modified Michelson interferometer system that utilizes a reflective grating in one arm and a rotation stage that can be directed at multiple mirrors in the other arm in order to meet this goal.	
		Team Members:	Pellegrino Conte, Lei Ding, Maxwell Wolfson
		Supervisor(s):	Professor Thomas Brown
		Customer(s):	Tao Chen, ASML

OPE	Location	**Designing a New Imaging System for Training Surgeons**	
	F8	Our project is a new optical illumination and imaging system, to be used by doctors in the Urology Department, when they conduct practice surgeries for removing kidney stones. Our design utilizes Near Infrared light rather than X-rays, so that the doctors can conduct these practice surgeries in a safer environment.	
		Team Members:	Katie Armstrong, Nora Lane, Jeffrey Tsao, Joseph Kelly
		Supervisor(s):	Professor Greg Schmidt, Professor Wayne Knox
		Customer(s):	Dr. Ahmed Ghazi

OPE	Location	**Lens Design for Photoacoustic In-vivo Imaging Probe**	
	L1	The goal of this project is to design, fabricate and test an acoustic lens system to improve the performance of the in-vivo thyroid photoacoustic imaging probe. We focused mainly on reducing the attenuation seen within the lens, which resulted in apodization of the signal received at the sensor, by use of Fresnel lens structure. The lenses were 3D printed on a high resolution printer in the Rettner Fabrication studio and then tested over various depths of field.	
		Team Members:	Ryan Sauer, Daniel Graney, Nancy Aguilera, Yichen Gu
		Supervisor(s):	Professor Wayne Knox
		Customer(s):	Navalgund Rao, PhD, URMC

OPE	Location	**Optical Exhibit for RMSC**	
	D3	We created and exhibit for the Rochester Museum & Science Center for the 2020 Women in Science exhibition. Our project is inspired by Katherine Burr Blodgett who pioneered anti-reflective coating (invisible glass). By using the concept of index matching, we created our own "invisible glass" by immersing a glass into an index matching liquid through the use of a motor. The exhibit is educational and interactive for the general public.	
		Team Members:	Haley Knapp, Stephen Chess, Zilong Li
		Supervisor(s):	Professor Wayne Knox, Professor Duncan Moore
		Customer(s):	Calvin Uzelmeier, Director of Featured Content, Exhibition Support & Special Projects, Rochester Museum and Science Center

OPE	Location	**Plenoptic Imaging**	
	F5	Designing the post processing algorithm for a plenoptic imaging system that allows for the focus of an image to be changed after it has been taken.	
		Team Members:	Wen Zhou, Grayce Huang, Weichen Yao, Stephen Watson
		Supervisor(s):	Professor Scott Carney
		Customer(s):	Navitar

OPE	Location	**Profilometry: A tool for Tuberculosis Detection**	
	G8	The TB team utilized profilometry, an optical method, to meet the basic criteria requested by the customer. This design explores the physical traits such as area and volume of the skin reaction to the PPD injection. This solution is similar to the current medical procedure, but will eliminate the subjectivity of measuring the spot by hand or simply judging size via the human eye.	
		Team Members:	Sze Wah Lee, Coco Yang, Rebecca Silver, Madilyn Beckman
		Supervisor(s):	Professor Andrew Berger, Professor Wayne Knox
		Customer(s):	Arnulfo Torres

OPE	Location	**Team Film**	
	D1	The team designed a dual angle camera imaging system to function as a spectrophotometer to measure thin film thickness under Professor Jennifer Kruschwitz's supervision. The final product will be delivered to RIT Microelectronics lab.	
		Team Members:	Yang Deng, Diana Magana, Zheng Tan
		Supervisor(s):	Professor Jennifer Kruschwitz
		Customer(s):	Professor Jennifer Kruschwitz

OPE	Location	**Team VISION**	
	G2	The goal of this project is to develop a visual image simulation tool for DigitEyez to provide accurate prescriptions for eye care while reducing the time, cost, and error currently associated with eye exams. The Visual Image Simulation tool will aid ophthalmologists to give more accurate prescriptions. The VIS tool will be used in conjunction with DigitEyez's proprietary algorithm, which will determine the ideal prescription of the patient without subjective measurements. The patient's feedback from using the VIS tool will confirm that the prediction is correct or not.	
		Team Members:	Ali Hashim, Perry Wang, Weidi Liu, Diego Martinez
		Supervisor(s):	Jennifer Hunter, Ph.D.
		Customer(s):	Dr. Brandon Zimmerman, CEO DigitEyez

OPE	Location	**VR/AR Team**	
	H4	Characterization of 280° field of view lens by measurement of slanted edge MTF across the full field.	
		Team Members:	Barry Magenya, Mike Brunsman, Mitchell Soufleris
		Supervisor(s):	Aaron Michalko
		Customer(s):	Raptor Vision LLC

OPT	Location	**Classical MTF-Based Wavefront Sensing**	
	N4	I have performed a theoretical and experimental study into the effectiveness of using Tangential and Sagittal (aka classical) MTF measurements as inputs to a wavefront sensing algorithm. This includes doing more than 3,000 simulations for statistical analysis and multiple experimental trials. The projects' conclusion is that the loss of Fourier phase caused by using MTF is not very important, however the azimuthal undersampling of only having T&S MTF breaks the algorithm for non rotationally invariant aberrations.	
		Team Members:	Brandon Dube
		Supervisor(s):	Professor James Fienup
		Customer(s):	

OPT	Location	**Directing Light With 300 Atoms**	
	Poster Area	We designed and build atomically thin waveguides and demonstrate their ability to guide light in a chip based setting. Designed to work in silica imbedded atomic layer deposition titanium dioxide, we fabricate and characterize the thickness of optical ring resonators. Slimming down the thickness of the ring resonator highly delocalizes the mode and suppresses boundary wall scattering, the most common limiting loss in integrated photonic devices. We systematically demonstrate classical guiding and investigate the existence of resonances with a scanning cavity tuned laser diode	
		Team Members:	Jonathan Dietz
		Supervisor(s):	Professor Jaime Cardenas
		Customer(s):	

OPT	Location	**Femtosecond Diagnostic Methods**	
	Poster Area	The project looks at the development and analysis of autocorrelator systems for measurement of ultrashort laser pulses This includes the construction of a femtosecond laser source.	
		Team Members:	Markus Rothacker
		Supervisor(s):	Professor William Renninger
		Customer(s):	Renninger Lab

OPT	Location Poster Area	**Single Emitter Fluorescence in Plasmonic Gold Bowtie Nanoantennas**	
		Cutting-edge quantum technologies often demand single photons as the carrier of information. This project aims to address the source of said single photons. The single photon emission properties of semiconductor quantum dots and NV centers in nanodiamond were investigated as well as the effects of plasmonic gold bowtie nanoantennas on the single emitters.	
		Team Members:	Jeremy Staffa
		Supervisor(s):	Professor Svetlana G. Lukishova
		Customer(s):	

OPT	Location P3	**Split-Step Beamlet Method for Modeling Nonlinear Frequency Mixing**	
		This project aims to create a numerical method for modeling nonlinear effects through complex crystal geometries that is flexible enough to handle non-planar surfaces and misalignment without additional effort on the part of the laser systems designer. This is accomplished with the help of existing coherent ray propagation functionality within the non-sequential ray tracing software FRED.	
		Team Members:	Jonathan Heinz
		Supervisor(s):	Professor Jake Bromage
		Customer(s):	

OPT	Location Poster Area	**Terahertz Computational Ghost Imaging**	
		We acquired images of objects in the terahertz wavelength regime using only a single pixel intensity sensitive detector.	
		Team Members:	Kaia Williams
		Supervisor(s):	Professor Robert Boyd, Professor Xi-Cheng Zhang
		Customer(s):	

OPE	Location Poster Area	**Optimizing Signal to Noise in Second Harmonic Generation Microscopy**	
		Team Members:	James Emery, Ava Hurlock, Jordan Rabinowitz, Yuanchao Wang
		Supervisor(s):	Professor Wayne Knox
		Customer(s):	Dr. Robert Hill of Harmonigenic