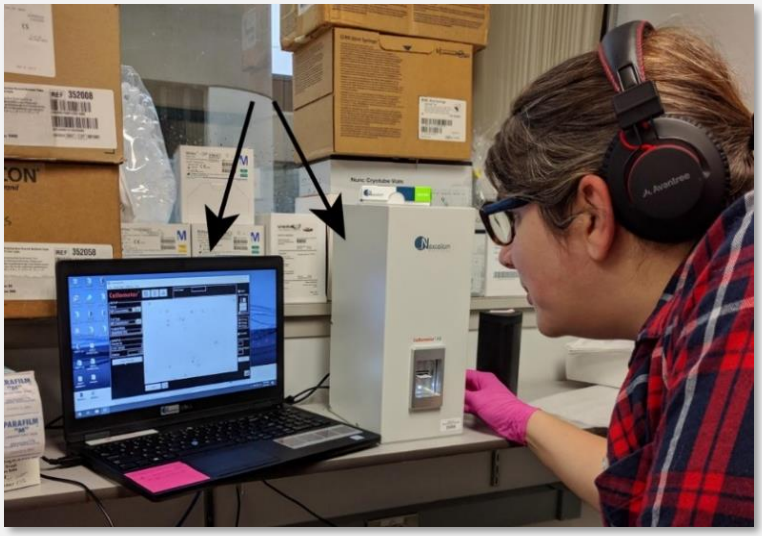
Research Success with 2018 Small Equipment Investment from Office of Research & Dean's Office

For the second year in a row, MCW investigators had the opportunity to submit requests for small equipment or software needed for a research project in their lab for fiscal year 2018. The Office of Research and the Dean's Office collectively awarded $135K in small equipment to 14 different faculty researchers. Having these items up and running for several months, awardees are pleased to report how the investment is advancing their research and benefiting their teams.

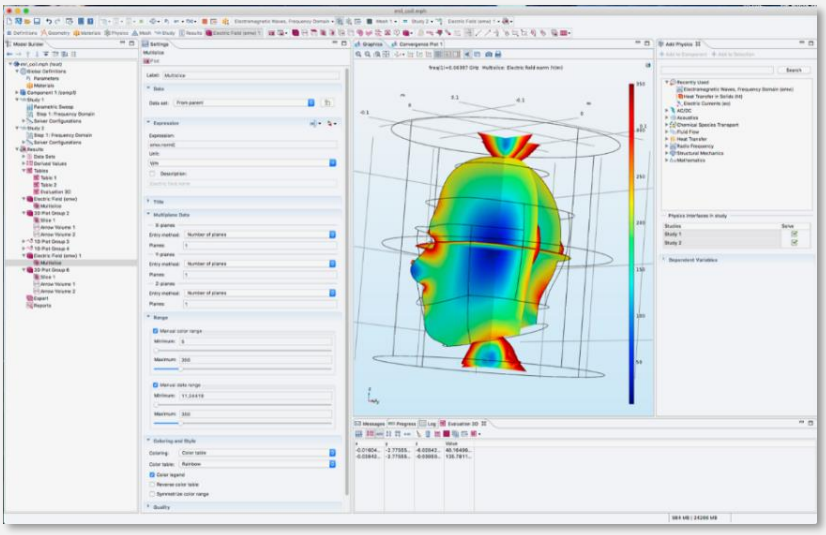
In the department of Medicine, **Dawn Wolfgram, MD**, and her team in the division of Nephrology were awarded a Nonin SenSmart Universal Oximeter to measure changes in regional tissue oxygenation during hemodialysis sessions. Cerebral oximetry, a marker of brain perfusion, is the main predictor variable to see if changes during hemodialysis have lasting effect on cognitive status in their patients. Dr. Wolfgram's study, "Intradialytic cerebral oximetry and cognitive outcomes in older adults on hemodialysis," investigates how changes in cerebral oximetry during hemodialysis have lasting effects on cognitive status in patients. She is currently collaborating with Dr. Brian Schmit of the joint Biomedical Engineering department, who also helped review the technology.

Amy Hudson, PhD, and the department of Microbiology & Immunology were awarded a Nexcelcom K2 Cell Counter. The K2 Counter allows Dr. Hudson's team to more accurately and reproducibly estimate the percentage of cells that are infected with their virus, human herpesvirus (HHV-6). HHV-6 is difficult to propagate in cells because it spreads best when an infected cell comes into contact with an uninfected cell, therefore the team must propagate the virus by adding non-infected cells to infected cells, then wait for some of the non-infected cells to become infected. For this to work consistently, the percentage of cells that are actually infected must be known. If 50% of the cells in the "infected" cell culture are infected, it is too early to add fresh uninfected cells. If 80% of the cells are infected, then it is time.

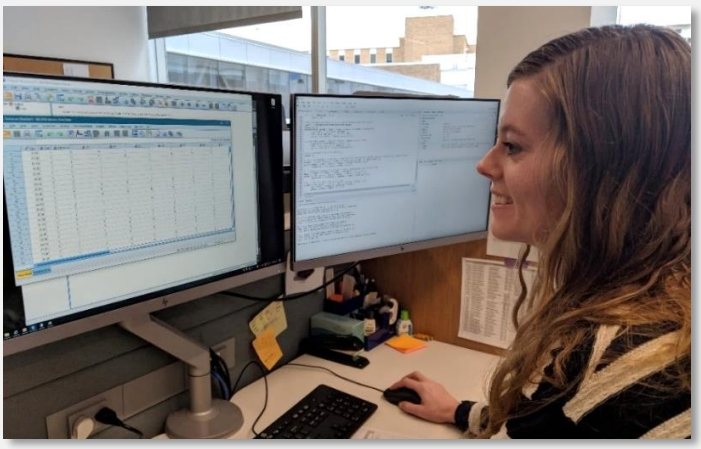
HHV-6 infection causes infected cells to become enlarged. The K2 Counter determines the diameter of every cell it counts, then plots the distribution. The size of the cells indicates the percentage of infected cells in the culture. Prior to receiving the K2 Counter, the team had no way to tell whether the infected cells were ready to be mixed with uninfected cells or not. Now, they can use the K2 counter to quickly compute a number and more reliably propagate the virus. This saves a huge amount of time and makes virus infections more consistent from sample to sample. The heavily used K2 Counter is appreciated among its users and has been invaluable to the Hudson Lab.



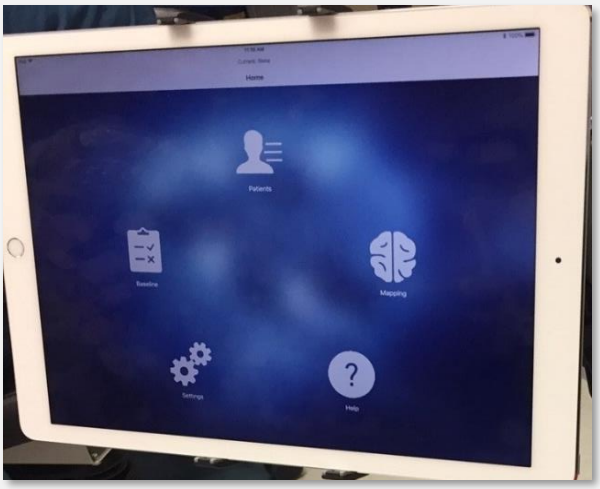
The Program in Chemical Biology (PCB) brings structure-based drug design and synthetic/medicinal chemistry to MCW, serving faculty across MCW departments and beyond. The two most time-consuming challenges in synthetic chemistry are (1) determining what molecules are produced in a reaction and (2) purification of the desired molecule from a reaction. To address both challenges, the PCB purchased a small molecule purification system that combined automated chromatography with mass-directed fractionation. Since obtaining this instrument, however, the team found that ~40% of molecules are undetectable using the original atmospheric-pressure chemical ionization source and therefore unamenable to mass-directed purification. PCB Associate Director **Brian Smith, PhD**, was awarded an Electrospray Ionization (ESI) Source and ASAP Capillary Source upgrade for their existing Biotage Dalton system. This upgrade increased successful mass detection to >90% of molecules, thereby accelerating discovery of new chemical entities. The Dalton is also used for quality control of purchased compounds for structural biology and high-throughput screening studies. The ESI and ASAP capillary sources will enable analysis of peptides/proteins and thin-layer chromatography plates, which were incompatible with the Dalton as original configured. This upgrade has broadened utility and increased throughput of molecule characterization and purification for projects supported by the PCB, including an R01 award from NIDDK to Dr. Smith, an R35 award from NIGMS to Dr. Smith, and an R01 award from NIGMS to Dr. Brian Volkman.



A COMSOL software package was awarded to **Tugan Muftuler, PhD**, and the department of Neurosurgery specifically for the 7T MRI machine. COMSOL performs advanced multi-physics simulations that allow Dr. Muftuler to simulate how a new radio frequency (RF) probe for an MRI system will perform before he actually builds it. Prior to using this software, an initial probe design needed to be built to determine whether its performance met specifications, a process that usually required several iterations for an optimal probe. Instead of rebuilding a new probe with modifications, Dr. Muftuler can now use this software to run a quick simulation, review performance criteria on a computer, and easily tweak the design easily in software. Not only does the COMSOL software save time, it is also far more cost effective than building several probes and testing them on the bench. The goal is to improve homogeneity of electromagnetic fields in the MRI for the ultra-high field MRI system. This software will help Dr. Muftuler's team improve the homogeneity of RF fields in the 7T MRI for imaging researchers across campus.



In the division of Trauma and Critical Care within the department of Surgery, **Terri deRoon-Cassini, PhD**, and her team were awarded a statistical software package and computer to support the Milwaukee Trauma Outcomes Project. The system is used on a daily basis for data input and processing. It is capable of performing sophisticated data and network analysis for evaluating structure of post-traumatic stress disorder. Dr. deRoon-Cassini's team is currently under review for an R01. If awarded, they will be able to conduct the network analysis and machine learning analysis proposed in the grant. Additionally, the new system has already allowed the team to identify analyses that they can conduct in three separate collaborative manuscripts with researchers from the VA and Marquette University.

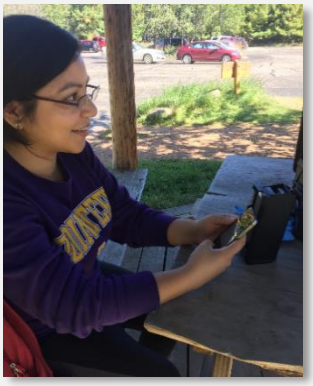
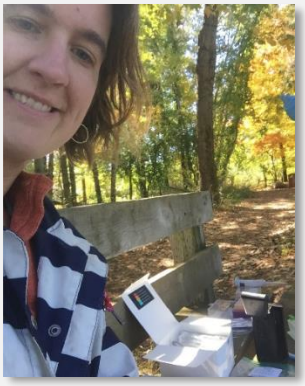


Two iPads and special accessories have been awarded to **Jennifer Koop, PhD**, in the department of Neurology to put a novel idea into practice: Dr. David Sabsevitz's NeuroMapper iPad platform. Dr. Sabsevitz, an adult neuropsychologist, developed his idea with collaborators from UWM as a part of his MCW Faculty Vitality Award. NeuroMapper is an extra- and intra-operative mapping program for various cognitive functions. The iPad systems successfully implemented the NeuroMapper tool and have been used in pediatric epilepsy surgery cases. In addition to providing valuable clinical data, the equipment and program also allows Dr. Koop and her team to collect data on standardized mapping protocols across a variety of patients to allow for novel research programs. This use of NeuroMapper is one of the first across the country with pediatric patients. As such, Dr. Koop continues to collaborate with Dr. Sabsevitz to further develop the program for pediatric patients and to provide efficacy data. The use of NeuroMapper within the CHW pediatric population has also led to emerging research projects with Neurology and Neurosurgery collaborators.

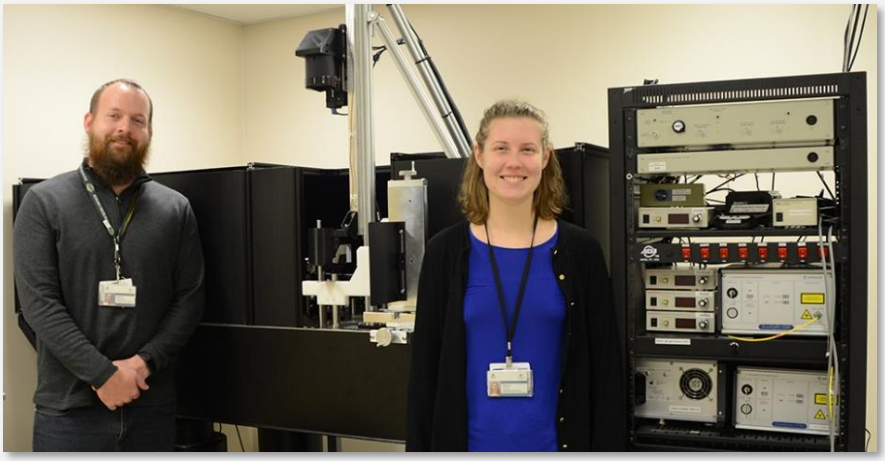
Jenifer Coburn, PhD, was awarded a BioRad CFX Real-Time Thermocycler for the Center for Infectious Disease Research (CIDR). The new instrument measures fluorescence emitted by a DNA dye that intercalates into the DNA as it is made. Based on known standards, the amount of DNA in an unknown sample can be calculated. It can also measure RNA transcript levels after reverse transcription of the RNA into DNA. Several groups within the CIDR are utilizing the Thermocycler, and these new capabilities will contribute to multiple 2019 grant applications.

A Biomeme two3 Real-Time PCR Thermocycler was awarded to **Amy Prunuske, PhD**, and the department of Microbiology and Immunology. The portable equipment allows Dr. Prunuske and her team to test ticks outside of the lab to determine whether they contain the bacteria that causes Lyme disease, Anaplasmosis, and Babesiosis. For her "Field Detection of Tick-borne Pathogens" project, Dr. Prunuske is collaborating with students from UW-Stevens Point. Having this portable device has allowed for additional testing, which increases the amount of data available to study and track disease. Data from multiple locations also supports a temporal and geographical mapping out of differences. A publication is already in the works, likely the first of many to use this new data.



In the Advanced Ocular Imaging Program (AOIP) within the department of Ophthalmology & Visual Sciences, **Joseph Carroll, PhD**, and his team were awarded funds to build new custom computers to upgrade their existing adaptive optics scanning light ophthalmoscopes (AOSLO). These imaging systems allow non-invasive imaging of the living retina and provide diffraction-limited resolution. The new computers support an 8-lane PCI Express digitizer (facilitating high-speed data transfer) and expand the number of detection channels that can be acquired simultaneously. This expanded capability will allow imaging the retina using novel detection schemes – increasing the contrast of otherwise transparent structures such as ganglion cell nuclei and photoreceptor inner segments. These computers also enable the integration of a state-of-the-art fixation system. The new fixation system is part of a major initiative in the lab to fully automate the processing of AOSLO images. Shown are two members of the AOIP team (Brian Higgins and Jenna Cava) with one of the AOSLOs following installation of the new fixation system.



The following faculty were also awarded with small equipment for their existing projects: **Matthew Budde, PhD**, was awarded a Noninvasive Blood Pressure System (CODA) to support his "Noninvasive and MRI Compatible Blood Pressure Monitor" project; **Jutta Novalija, MD, PhD**, was awarded a Portable Ultrasound with Transducers for Cardiac and Vascular Imaging" to support her "Translation of Ultrasound Skills from Simulation to Real Life Application" project; **Jimmy Feix, PhD**, was awarded a Nicoya Open Surface Plasmon Resonance (SPR) instrument to support his "Benchtop SPR" project; **Matthew Scaglione, PhD**, was awarded an upgrade for the Biochemistry liquid handling robot to support his "Dissecting Protein Quality Control Pathways in ALS" project; **Johnny Hong, MD**, was awarded a Portable -80°C Medical Freezer to support his "Assessment of Energy Metabolism and Molecular Characterization in Hepatic Allografts for Human Liver Transplantation" project.