This last year the Richard Witte Endowed Professorship funds have enabled the 20-member MOST (Michigan Tech Open Sustainability Technology) research group to tackle a wide range of new ideas. Funds were used to provide materials and supplies for four undergraduates on MacArthur Fellowships, a Link Fellowship, a Devlieg Foundation Intern, Portage Foundation Intern and Young Investigator award. Funds were also used to support projects from six graduate students and several visiting scholars as well as staff. This helped the research team to publish 8 peer-reviewed articles, which resulted in preliminary data and exposure that has helped leverage several million in additional funding. The MOST group’s general frugality has led it to being probably best known for making extremely inexpensive high-quality scientific tools and low-cost solar energy and the Endowed Professorship has been stretched to maximize scientific impact and media recognition for the betterment of humankind.

Generally, the Witte Endowment was used as support researchers funded by other means by buying their supplies, testing, or random other expenses (e.g. poster printing or postage to ship samples to international collaborators), or as bridge support between grant cycles for specific students. It therefore affected everyone in the twenty-member group positively even if it did not directly pay their salaries. This flexibility to apply funds quickly where they were needed was critical. The Witte Endowment was therefore instrumental in helping Dr. Pearce break the 10,000 citations mark and maintain more than 2,000 citations per year, which is the highest citation rate in Michigan Tech’s history according to Google Scholar.

Details of expenditures: Labor
Fiscal 2019

- Funded some staff time (e.g. Anzalone and Khaksari) a small amount of graduate student time (very partial) and mostly undergraduate research time to perform experiments or build equipment. A good example is the ~$1k spent on Khaksari’s time funded her to work with me to develop a new application of the ultra-high-resolution hybrid ion trap orbitrap mass spectrometry in the ChARM facility on campus. This work resulted in the only high impact article published by the MTU facility this year and we used it for preliminary data on several proposals still pending to develop alternative foods (e.g. a DARPA project to turn waste plastic into food).

Fiscal 2020

- Funded some staff time (e.g. Leftwhich) a small amount of graduate student time (very partial) and mostly undergraduate research (7 students including 5 females) time to perform experiments or build equipment. Leftwhich’s time for example was used for additional materials analysis to help Nupur (MSE PhD female, visible minority) and two undergraduates perform more experiments to understand ALD interactions with plastic that will be published next year. This is a high-risk high reward project that we should see the payoff from next semester.

Non-Labor Fiscal 2019-2020

- Non-labor expenses included publishing fees, chem stores chemicals, materials testing and facilities fees (mechanical, XRD, SEM, etc.), mail charges, poster printing, laptop computers,
glassware, electronics, mechanical hardware, filament, safety equipment, welding supplies, and other lab supplies. These small expenditures when you need them are critical for rapid scientific progress and the Witte Endowment removed financial pressure even from funded projects as we could just spend money on what it needed to be spent on without going back to funders to reclassify expenses.

**Outputs**  
*Student coauthors in bold*

New articles in open hardware for recycling plastic and 3-D printing composites:


These articles helped forge the relationships and provide data for:

- S.Snabes, M. Fielder, Joshua Pearce, SBIR Phase II: Increasing Maker Manufacturing through 3D Printing with Reclaimed Plastic & Direct Drive Pellet Extrusion. The National Science Foundation $749,111, re:3D, Inc $260,000 for MTU.

Using these same techniques we made several free devices to help those in need (blind, labs in the developing world) and alternative food for the world’s hungry:

- Joshua M. Pearce, Maryam Khaksari, and David Denkenberger. Preliminary Automated Determination of Edibility of Alternative
We have continued our work to spread solar energy widely:

  - Was widely reported in the media – including CNBC, Yahoo Finance and more than 30 other news outlets.
  - Our reputation as leaders in solar energy research helped win a major award that will continue for the next 5 years: Kathleen E. Halvorsen, Joshua Pearce, Rebecca G. Ong, Richelle Winkler, Chelsea L. Schelly "GCR: Collaborative Research: SocioTechnological System Transitions: Michigan Community & Anishinaabe Renewable Energy Systems," National Science Foundation, $1,012,875 to Michigan Technological University for support of the project described in the proposal referenced above. This award is expected to total $2,723,647.
  - We are also in negotiations now with the DOE over a project involving rabbit-based agrivoltaics, where we will get help from rabbits to weed solar farms to help improve productivity per acre even higher.

Last but not least it helped fund the open source initiative at Michigan Tech now housed at http://opensource.mtu.edu/
There is always a lag between the time research is done and the time it is published and makes greater impact. There are more than a dozen additional Witte-funded (at least in part) articles under review currently as well a half a dozen grant proposals in preparation or submitted. We are extremely grateful for the Richard Witte Endowed Professorship, which has been an enormous help for the MOST research group in aggressively exploring new ideas that would have been impossible otherwise.