

Research Statement

Matthias W. Pleil – 2019-2020

Background

My current research, teaching and clean room management responsibilities all overlap and are synergistic with each other.

I'm currently in the academic world wearing several hats to propel the education of our future engineers and technicians forward. I am currently the PI on an NSF ATE Center grant, the Support Center for Microsystems Education (SCME) that has been continually funded since 2004. I also am a Research Professor and Lecturer III in Mechanical Engineering, as well as the MTTC Cleanroom Manager and Associate Director of the MEP Program. Within these roles are many challenges and rewards; I get to do a wide variety of things that I find engaging – creating new ways of passing knowledge onto others through multiple means, working with colleagues locally and across the country, and contributing to the STEM educational community at large – especially those interested in Microsystems and Engineering. My goals and objectives include:

- Continue teaching students while continuously growing personal skills and knowledge in teaching and learning, Mechanical Engineering, computer aided design, microsystems characterization and fabrication.
- Mentor and educate to produce highly prized engineers for industry and research environments.
- Actively seek and obtain funding to support the advancement of research, development and education to better prepare students to be successful in emerging technology fields that drive our nation's economy.
- Research and apply best practices for educating students, educators, and industry professionals through research, conferences and networking. I am especially interested in hands-on project based and hybrid online education.
- Discover, create and innovate advancing processes, designs, skills, knowledge, and know-how in a collaborative environment.
- Support the National Science Foundation Department of Undergraduate Education Program by continuing to serve on review and advisory panels for current and proposed projects and mentoring “New to ATE” PI's.
- Support professional organizations including the Micro Nano Technology education Special Interest Group (MNTeSIG), The Association of Technology, Management and Applied Engineering (ATMAE), NSF ATE, and UNM's STEM outreach communities.

History of Past Research

The following is a list of awarded research proposals totaling approximately \$10M spanning 16 years. These grants were mostly NSF Advanced Technological Education (ATE) centers. During this time, my team created educational materials, trained hundreds of secondary and post-secondary educators, impacting tens of thousands of students. Online materials have been shared throughout the country and can be found on several grant websites, YouTube channels and partner sites (Nano-Hub, ATE Central). With over 10,000 document downloads per month globally and thousands of YouTube views, we have established ourselves as the Microsystems Education resource.

Grants Awarded

- [1] 2003, Awarded, M. Pleil, F. Lopez, H. Weaver, and J. Wood, Requested: \$2,798,063, Received: \$2,798,063, “Southwest Center for Microsystems Education”, National Science Foundation, Central New Mexico Community College, NSF DUE# 0402651, 2004-2008.
- [2] 2008, Awarded, M. Pleil, Requested: \$81,500, Received: \$81,500, “Nanoscience Online Course”, New Mexico Public Education Department, University of New Mexico, February, 2008 - June, 2008.

- [3] 2008, Awarded, M. Pleil, F. Lopez, N. Vadiie, and J. Wood, Requested: \$2,446,434, Received: \$2,444,434, "Southwest Center for Microsystems Education", National Science Foundation, University of New Mexico, NSF DUE# 0902411, 2008-2012.
- [4] 2008, Awarded - Transfer from CNM to UNM, M. Pleil, F. Lopez, H. Weaver, and J. Wood, Received: \$730,593, "Southwest Center for Microsystems Education", National Science Foundation, University of New Mexico, From DUE# 0402651 to DUE# 0830384, 2008-2010.
- [5] 2010, Awarded, Z. Leseman, M. Pleil, M. Hosseein-Zadeh, and C. Luhrs, Requested: \$200,000, Received: \$200,000, "NUE: An Integrated Multidisciplinary Nanotechnology Undergraduate Education Program at the University of New Mexico", National Science Foundation, University of New Mexico, #1042602, 2010-2014.
- [6] 2011, Awarded, M. Pleil, A. Bell, K. Jean, A. Hoff, and J. Wood, Requested: \$4,999,910, Received: \$3,360,144, "Southwest Center for Microsystems Education", National Science Foundation, NSF DUE# 1205138, 2012-2019.

Current State of Research

The SCME currently supports other higher educational institutions across the nation in their quest to provide students an education in Microsystems Technology. We are creating asynchronous online short courses for educators, students and industry employees complete with external certification assessments. The Support Center for Microsystems Education also works closely with Lone Star College in promulgating and maintaining the educational materials. Lone Star focuses on integrating BioMEMS learning modules and kits into their Bio Tech programs. We also have created and support the Micro Nano Technology Education Special Interest Group (MNTeSIG) which meets monthly, sharing resources, expertise and organizing an annual meeting in parallel with the High Impact Technology Exchange Conference (HI TEC) to: "Foster collaboration between educators at all levels, industry, and agencies for relentless improvement of the micro and nano technology workforce." Another of my many responsibilities is to provide mentorship/guidance to other faculty wishing to write proposal for the ATE program.

- [7] 2017, Awarded, M. Pleil, P. Auburn, D. Kainer, and J. Wood, Requested: \$1,592,089, Received: \$1,592,089, "SCME: Scaling Microsystems Support", National Science Foundation, University of New Mexico, NSF DUE# 1700678, 2017-2021.
- [8] 2018, Awarded, M. Pleil, Requested: \$43,995, Received: \$43,995, "SCME: Scaling Microsystems Support - Supplemental", National Science Foundation, University of New Mexico, NSF DUE# 1831042 - supplemental to Due# 1700678.

Future and Pending Research

I am seeking partnerships as I move forward to advance both engineering and technician education. Taking the lessons learned from the ATE Center activities, I am seeking collaborative funding with others as a sub-award or Co-PI to continue the work past my retirement years. I want to pass on what makes sense to the next generation of educators, so they can build on our work and continually improve the educational experience for students to better support the emerging technology workforce. The two pending grants are to innovate our graduate education here at UNM by bringing in hands-on micro-nano course(s) modeling what is done in industry and the other is to continue the work of the ATE Micro and Nano tech centers which are sunseting. SHINE, Nano-Link have sunset, NACK and SCME will be sunseting in the next few years and hence, NSF ATE has create an RFP for a National Micro Nano Center. SCME (Pleil), and NACK (Ehrmann) have successfully recruited and are mentoring Jared Ashcroft (Pasadena City College) and others to form the MNT-EC, Micro Nano Tech Education Center with a half a dozen other institutions of higher education. The ATE center will probably be funded, we have not heard back from

- [9] 2019, Pending, N. Jackson, M. Pleil, and V. Law, Requested: \$473,859, Received: TBD, "IGE: Applied Graduate Education Through Innovative Emerging Technology Experiences", National

Science Foundation, University of New Mexico, NSF #1954189.

[10] 2020, Pending - Subaward, J. Ashcroft, I. Cossette, N. Habibi, P. Kazarinoff, and G. Kepner, Requested: \$7,498,965, Received: TBD, "The Micro Nano Technology Education Center (MNT-