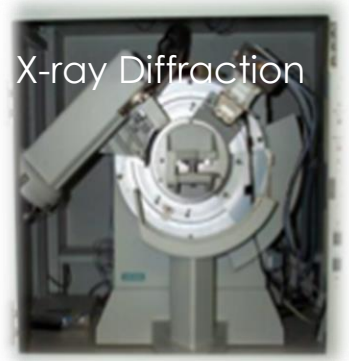
Center for Micro Engineered Materials

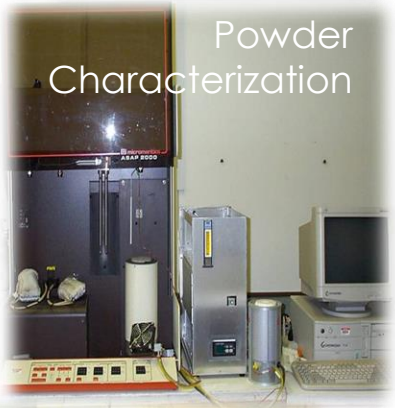
Fernando Garzon
Director
Professor: Chemical and Biological Engineering

2018 Annual Review Of Category 3 Research Centers/Institutes | 03/28/2019

Mission

The primary mission of the UNM Center for Micro-Engineered Materials (CMEM) is to serve as a focal point for collaborative, interdisciplinary, micro-engineered materials research, development and education





CY 2018 Goals And Status

CMEM's main goals are:

- To serve as a catalyst for the development of nano and micro-engineered technologies to make NM and the US more competitive.
- To collaborate with NM Universities, Sandia, LANL and AFRL in high quality materials R&D.
- To engage with UNM.STC to transfer these technologies to industry fostering the development of competitive businesses within the State of New Mexico.
- To support campus-wide nanomaterials research by maintaining high performance characterization facilities.
- To engage the UNM undergraduate and graduate STEM students in nano-materials & geologic materials research and development.
- To support interdisciplinary academic programs, such as Nanoscience and Microsystems Engineering and course offerings in CBE, CCB, EPS, ME and CCE

<u>CMEM's current Status</u>

- All CMEM user facilities are fully operational with research faculty supervision
- CMEM is operating within it's allocated budget
- Major increase in CMEM Faculty participation over FY17, 9 new members, 24 total, Including 5 Sandia and 1 AFRL participants

Membership of Advisory Committee

Christos Christodoulou, Dean of Engineering and Computing

Mark Peceny, Dean of Arts and Sciences

Sang M. Han, Associate Chair of Chemical and Biological Engineering

Jeff Rack, Chair of Chemistry and Chemical Biology

Yu-Lin Shen, Chair of Mechanical Engineering

Arash Mafi, Director of UNM Center for High Technology Materials

Elizabeth Kuuttila, President and CEO of STC.UNM

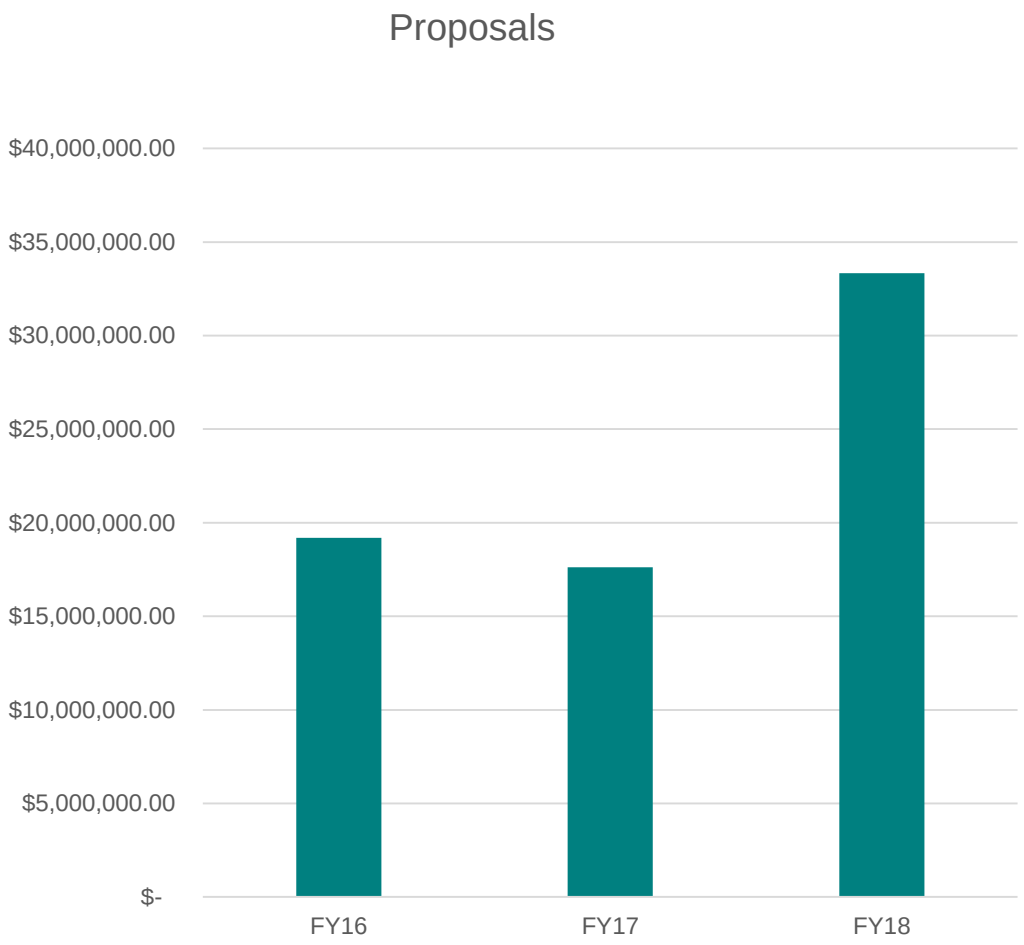
- November 19th 2018 Leadership Meeting

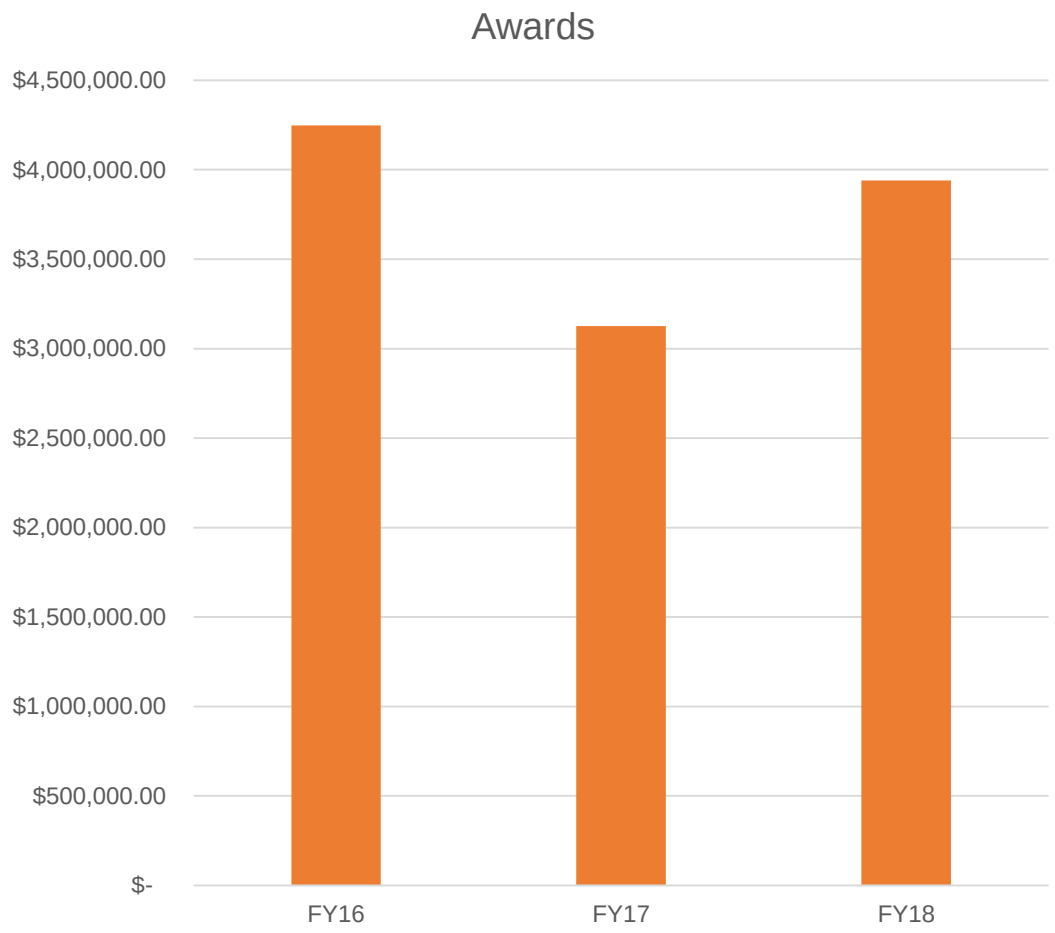
CY 2018 Highlights

:

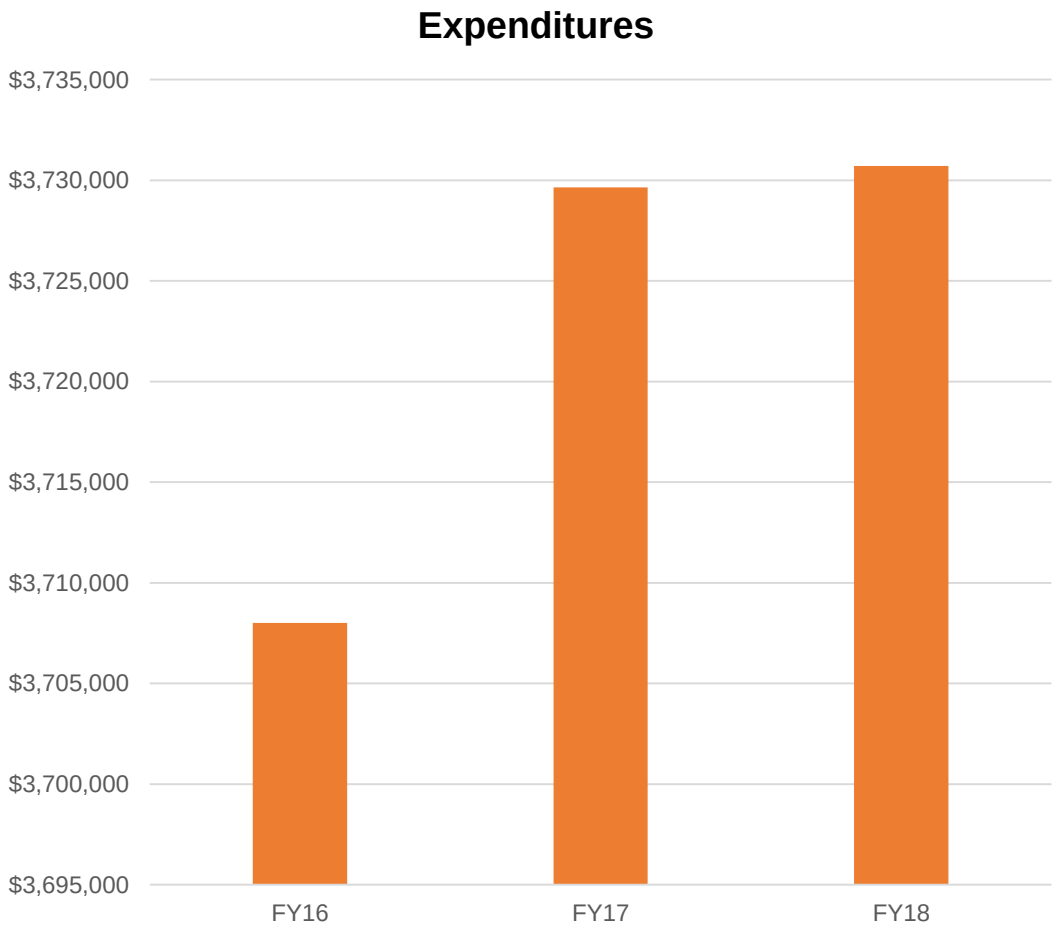
- Fernando Garzon CBE, Appointed CMEM Director for 2019
- Abhaya Datye 2019 Burwell Lectureship in Catalysis UNM becomes Prime ARPA-E recipient for Electrosynthesis of Ammonia, Fernando Garzon, P.I.
- CMEM wins 1.75M NSF Grant for Atomic Resolution, Aberation Corrected Transmission Electron Microsope for PAIS facility

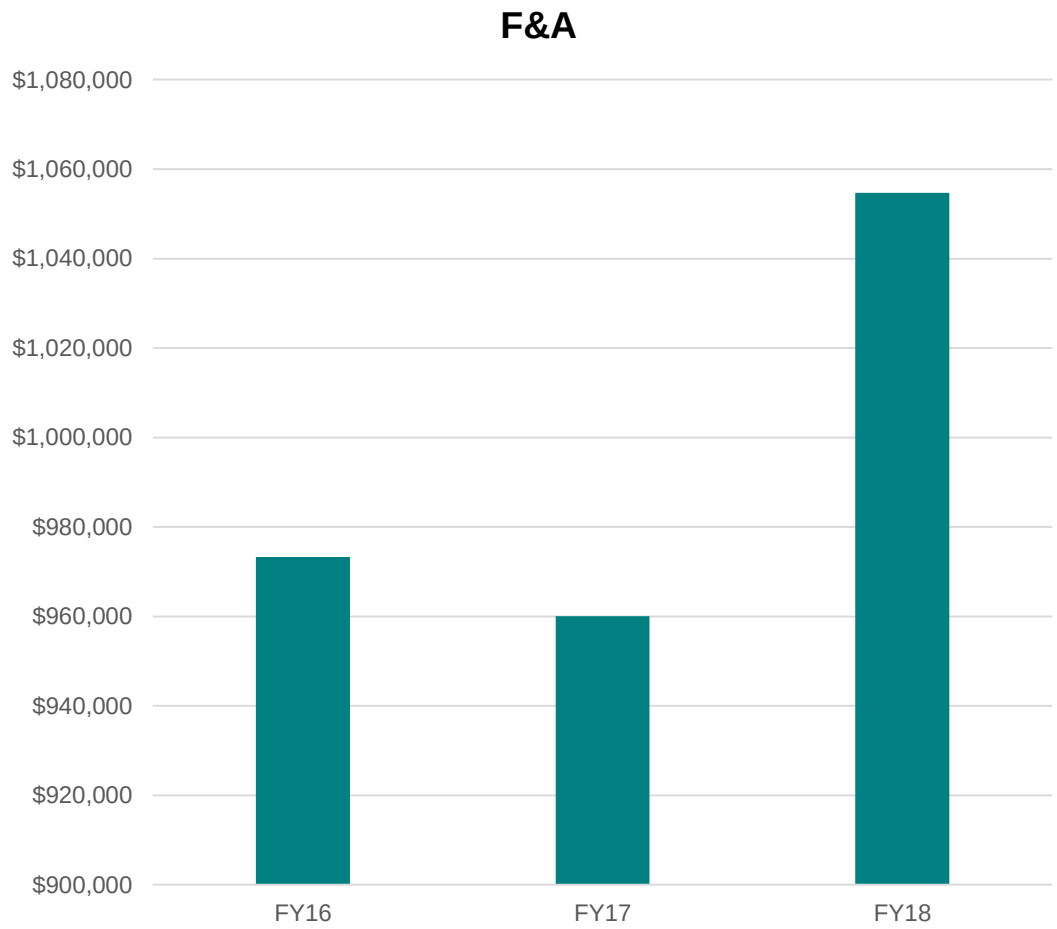
Proposals & Awards





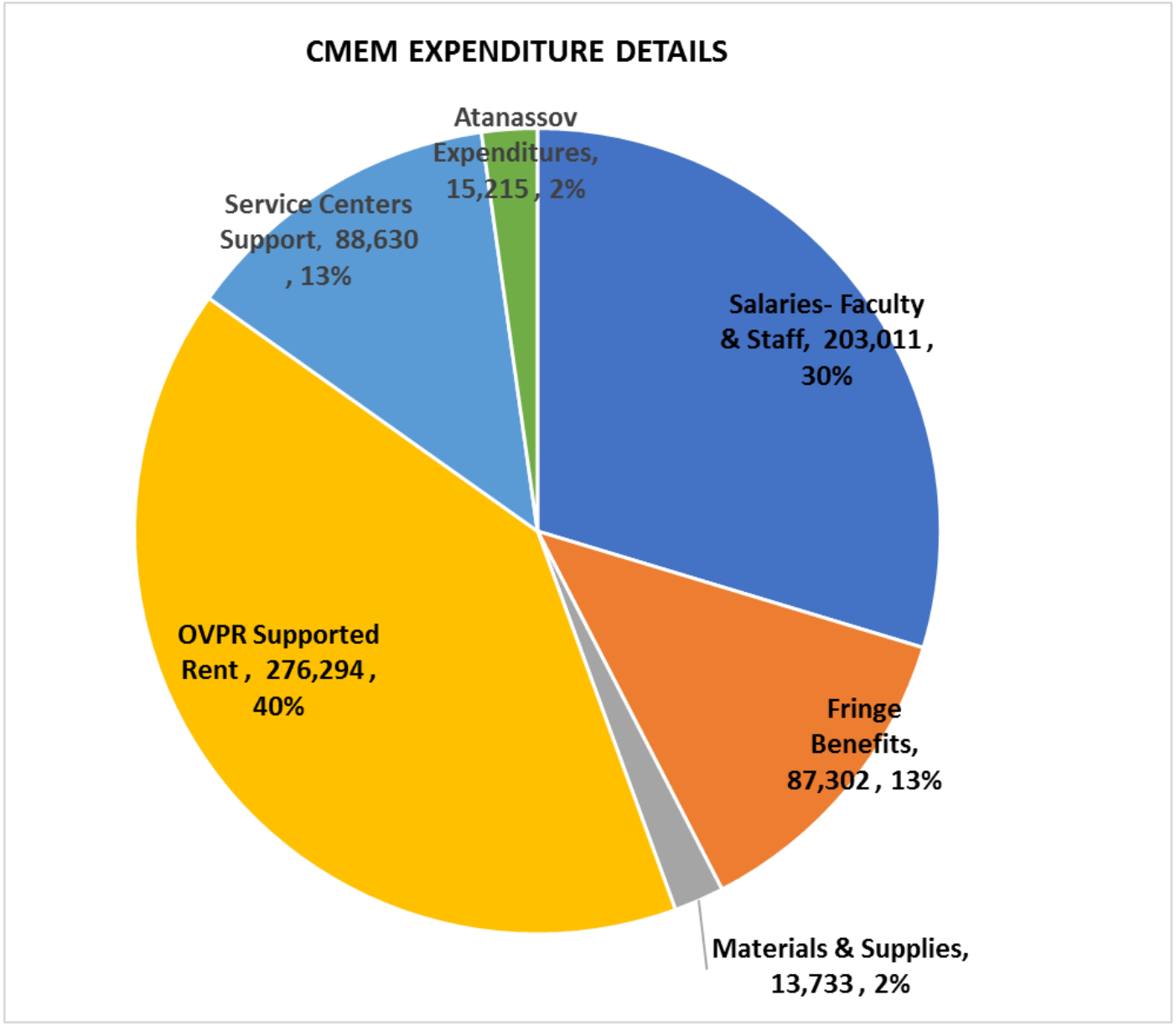
Research Expenditures and F&A





FY 18 Sources of Revenue

• VPR Allocation	$230,000
• F&A Return	$377,885
• VPR Pullback	- $18,698
• Cost Share	-$ 2,490
• PI O/H Return	-$ 50,688
• FY18 Carryforward	$121,941
TOTAL REVENUE	**$657,950**



Research Center Impacts

- CMEM provides access to major materials characterization instruments (TEM, SEM, FIB, XRD, XPS, XRD, XRF etc.) through 6 user facilities/cost centers. For all of these tools CMEM provides training to students and faculty researchers.
- Major research outreach activities are in partnership with STC.UNM and Rainforest Economic Development Forum. CMEM faculty engage also in education in community outreach through their programs.
- CMEM faculty (including a number of research faculty) teach courses in CBE, EPS, ME, CCE, NSME and CCB academic programs
- NSF-REU program educates and attracts many new students to UNM.
- Substantial fraction of CMEM research (up to 45% by the funding source) is in applied science and results in multiple collaborations with DOE national laboratories, DOD labs and industry. Currently CMEM in engaged in technology transfer to 3 NM startup companies and 3 large/multinational corporations.
- CMEM user facilities are a resource for the state and the region having sustained users in local research communities including LANL, SNL and AFRL.

Return On Investment

- CMEM researchers published 86 peer-reviewed articles in journals including *Science, Nature Comm., Angewandte Chemie*, etc.
- The number of research awards was 37, with total expenditures of $3.7M
- 17 U.S. patents filed/issued in 2018
- Industry engagement include partnering with large companies (Nissan) and specialized manufacturers (Proton-OnSite, Zircoa, Coorstek) on DOE-funded programs, as well as activities in NM such as Pajarito Powder LLC, IRD Fuel Cells, Automotive Test Solutions LLC
- NSF CISTAR Industrial Engagement includes Mobil/Exxon Chevron, Shell & 15 other companies

- CMEM brings world-class capabilities in micro and nanoscience and engineering -best in NM
- CMEM couples solution and colloid chemistry and physics with advanced manufacturing engineering to provide innovation
- CMEM provides multi-disciplinary theoretical, computational and experimental capabilities to solve complex problems

STRENGTHS

- CMEM established faculty is aging
- NM provides minimal State support
- CMEM facilities are aging
- CMEM does not have any endowments
- South Campus rental costs

WEAKNESSES

- Increased DOE & AFRL connections
- New UNM-Sandia-AFRL Facility
- Leverage new PAIS facility
- CBE recruiting new faculty

OPPORTUNITIES

- Declining basic science and engineering Federal support
- Recruitment of top graduate students more difficult-foreign student visa barriers and more job opportunities

THREATS

Looking Ahead To 2019

- CMEM will grown in size and capability with new members and appointments from Chemistry, EPS, ME, CCE, Sandia and AFRL.
  - CBE is committed towards the hire of ***two*** new CMEM faculty members
  - EPS is committed to recruit new junior faculty in mineralogy at the nanoscale, which will add to the user base for the labs in PAIS
  - Sandia is committed to hiring staff members who will work closely with CMEM
- CMEM is adopting a new form of governance with bylaws, a four person executive committee, and operations committee, fiscal review, regular meetings and enhanced collaborations
- CMEM will revaluate instrumental user fees to insure access while keeping facilities operational and performing at the state of the art ***FY18-All major tools functioning***
- CMEM will aggressively pursue large multi-disciplinary & multi-researcher grants and contracts
- CMEM will work with the Deans & VPR to help eliminate the rent burden, especially since the building loans have been paid off. This will allow CMEM to provide F&A return to the Deans of A&S and SOE and the departments of participating faculty

Summary

- CMEM completed the relocation of its major activities to AML and is utilizing the “west wing” as a self-sufficient operation: a cutting edge materials research site with unique synthesis, scale-up and materials integration capabilities supported by state-of-the-art characterization instruments, operated as user facility to benefit UNM, ABQ and NM community, and with a national network of users/sponsors.
- CMEM has strong national presence with multi-investigator participation in NSF, DOE and DOD programs, and international visibility through the professional service and visibility of its faculty and organization of major learned society events.
- CMEM at AML is a vibrant site at UNM Science & Technology Park, and is aiming to continue being a “human bridge” to SNL & AFRL supporting collaborations in materials research.
- CMEM has grown in size and capability with new appointments from ME, CCE, Sandia and AFRL