CENTER OF HIGH TECHNOLOGY MATERIALS (CHTM) - AN INSIGHT INTO OUR FACILITIES AND RESEARCH CAPABILITIES

presented at the

Advanced Research Success Series Workshop

by Maya Narayanan Kutty

CENTER OF HIGH TECHNOLOGY MATERIALS (CHTM)

Location: 1313 Goddard S.E, Albuquerque, NM 87106

The Center was established in 1983 with a seed investment of $10M by the New Mexico State

The building is 62,000sq.ft housing 22 labs plus the cleanroom

CHTM in Numbers

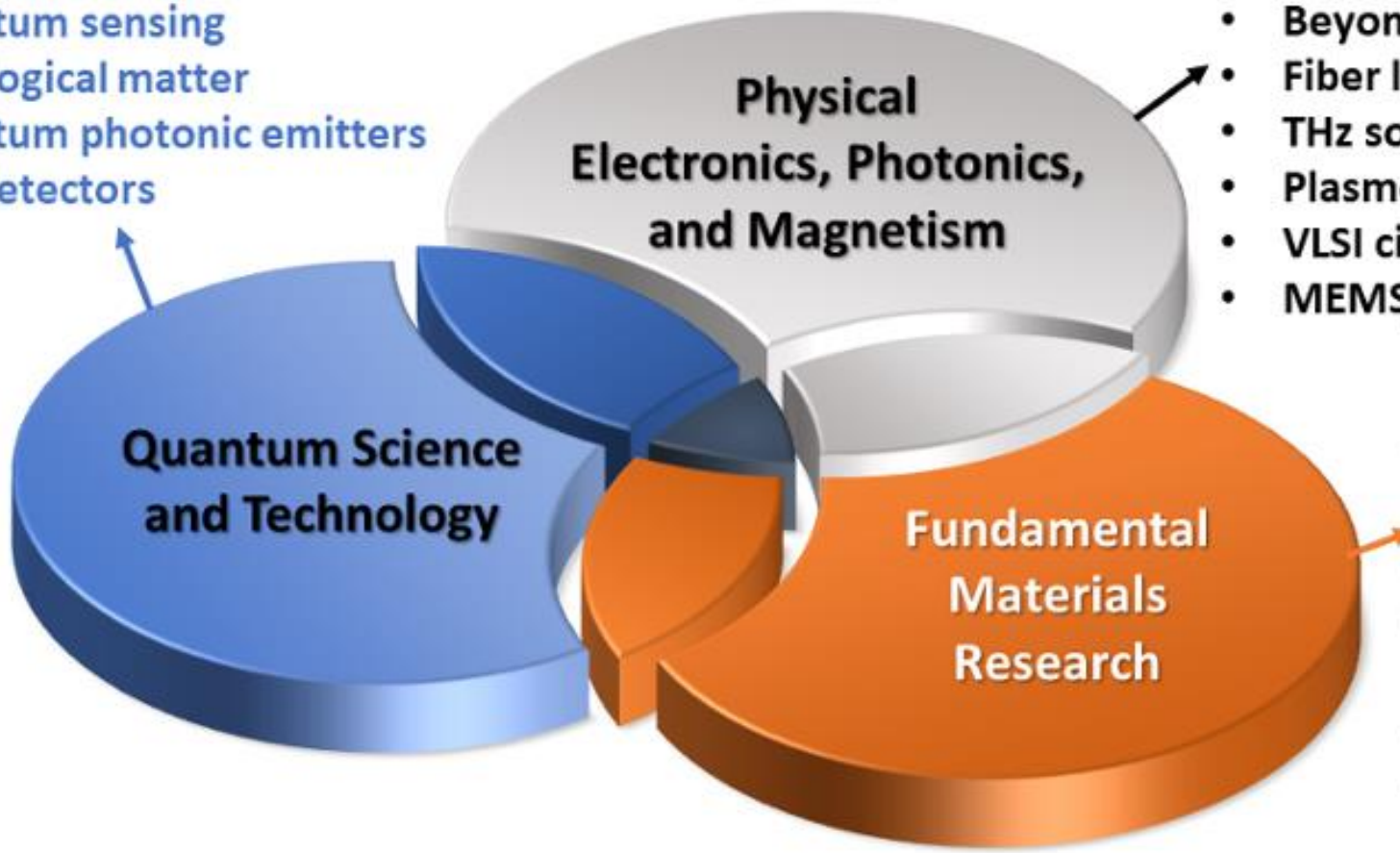
- $260M+ in grant awards,
- 268+ patents,
- 35% of entire UNM portfolio with only 14 faculty members, more than 30% of which are licensed,
- $90M+ patent revenue generated for UNM,
- Internationally renowned faculty (264+ papers with over 100 citations),
- Research at CHTM has enabled 287+ Ph.D. degrees, and 347+ M.S. degrees,
- 15 companies have been spun-off (CHTM faculty and student started)

Who we are

- 5 departments →14 Faculty: Tenured & Tenure-Track,
- 21 Research Faculty,
- 8 Post-docs,
- 14 Staff: Technical and Administrative,
- 54 Graduate Students,
- 16 Undergraduate Students,
- 10 High School Students

Core Capabilities and Research Themes

- Quantum sensing
- Topological matter
- Quantum photonic emitters and detectors



- Semiconductor emitters & detectors
- Non-linear optics
- Beyond Moore devices
- Fiber lasers & fiber optics
- THz sources and amplifiers
- Plasmonics
- VLSI circuits
- MEMS/NEMS

- Synthesis and processing science
- Multi-functional materials
- Surface and interface science
- Defects engineering
- Advanced microscopy and spectroscopy.

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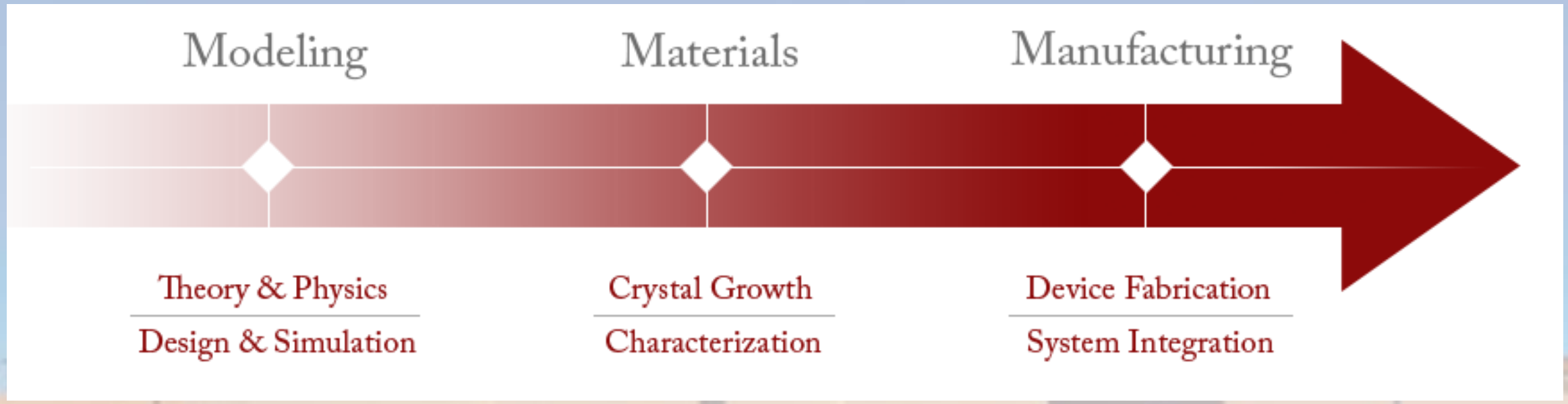

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Materials

Crystal Growth

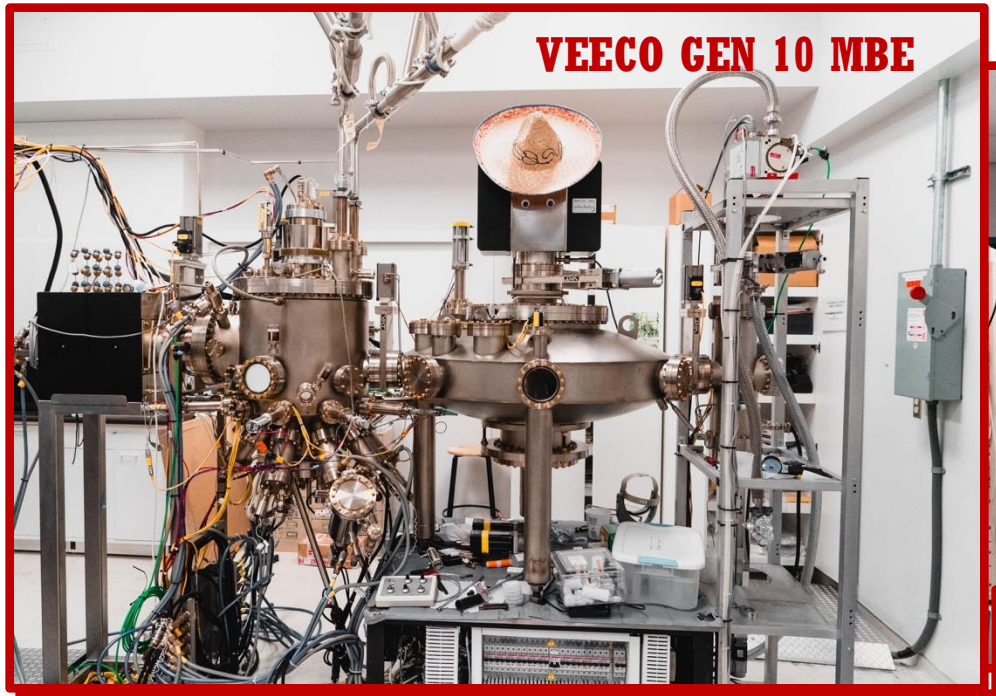
Characterization

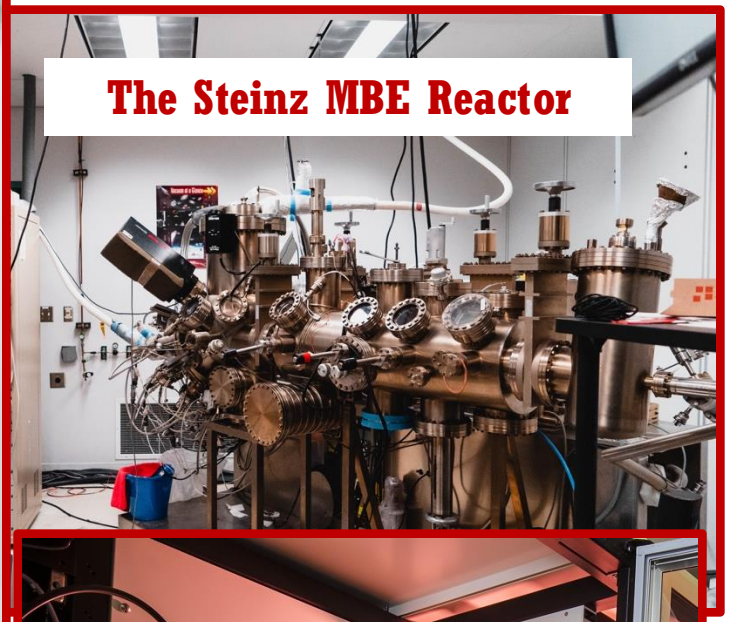
Semiconductor Material Growth

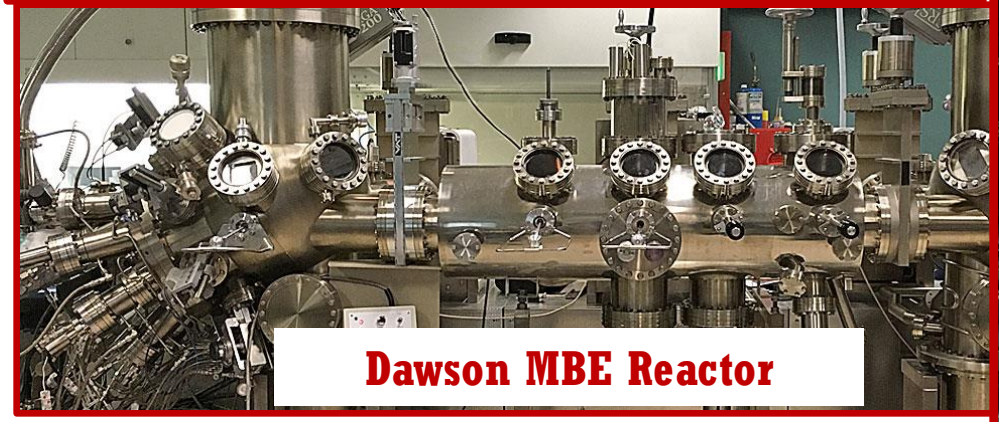
- **Molecular Beam Epitaxy (MBE)**
- **Metal Organic Chemical Vapor Deposition (MOCVD)**
- **2D material growth by Chemical Vapor Deposition (CVD)**

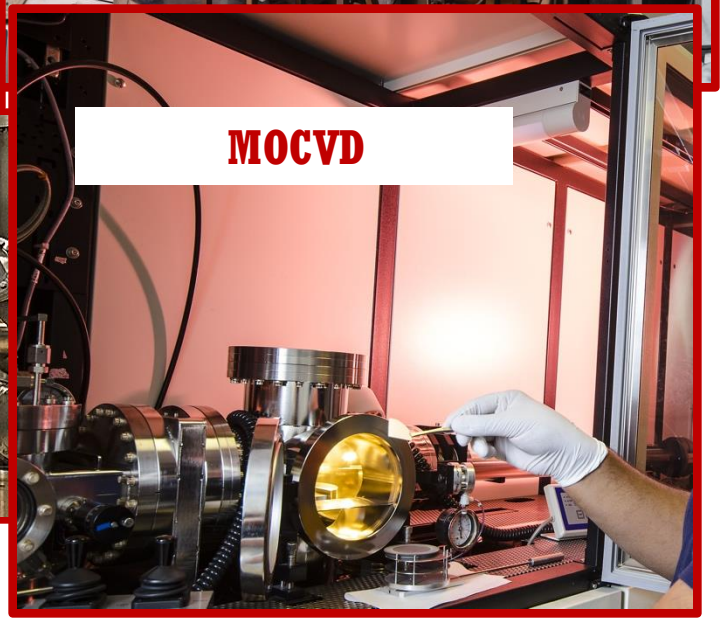
Material Characterization

- **Electron microscopy (SEM)**
- **Optical Spectroscopy (Spectrophotometer)**
- **Infrared Spectroscopy (FTIR)**
- **X-Ray Diffractometry (XRD)**









UNM NANOFAB AND SERVICE CENTER


RAITH VOYAGER EBL


NIKON ECLIPSE LV100ND LED Microscope


RAITH PIONEER Two SEM & EBL


KLA D600 Alpha-Step Stylus Profiler

UNM NanoFab Cleanroom

- 4772sq.ft
- Cleanroom-4bays +4 chases
- Class 100 0 (Bay 1,2,3,) & Class 1000 (Bay #4)

4 Staff Members; 3 undergraduate interns, 1 HS interns

41 tools inside the cleanroom

- 2 PlasmaTherm ICPs → Chlorine and Florine
- CHA E-beam Di-electric Evaporator
- PECVD
- Oxidation & Diffusion Furnace
- J. P. Wollam Ellipsometer
- DEKTAK Stylus Profiler
- Temescal- E-beam evaporator
- Thermal Evaporator
- PlasmaLab Plasma Metal Etcher
- 2 PlasmaLine Plasma Etchers
- RTA & RTP
- Karl Suss MJB Aligner
- Suss MicroTec MA-6 Aligner
- Spinners + Ovens+ Benches+ hotplates+ 3 Microscopes

Post fabrication- 5 tools

- Dicing Saw
- Wirebonder
- Chemical/Mechanical polisher
- ONTOS Plasma Etcher
- SETNA ACCRA 100 Flip-chip Bonder

- **UNM NanoFab Service Center**
  - **PERC2021**-Agilent Cary 7000 Universal Spectrophotometer
  - Malvern Panalytical Empyrean XRD
  - Quantum Dynamics MPMS (Magnetic System) with SQUID
  - JOEL JSM-IT100 SEM &EDX InTouch Scope with Smart EBIC system upgrade
  - ThermoFisher NICOLET s50 FTIR
  - ThermoFisher NICOLET iN10 FTIR
  - IL (Interferometric Lithography) Set-up
  - PL (Photoluminescence) Measurement Set-up
- **New Tools Installed-2025**
  - RAITH Voyager EBL (E-beam Lithography)
  - RAITH Pioneer Two (SEM & EBL)
- **Funded byWeR1 PERC Grant**
  - 2023-KLA D-600 Alpha Step Stylus Profiler
  - 2024-NIKON ECLIPSE LV100ND LED