



# The University of New Mexico Two-year Technician Student Undergraduate Research Experience in Microfabrication

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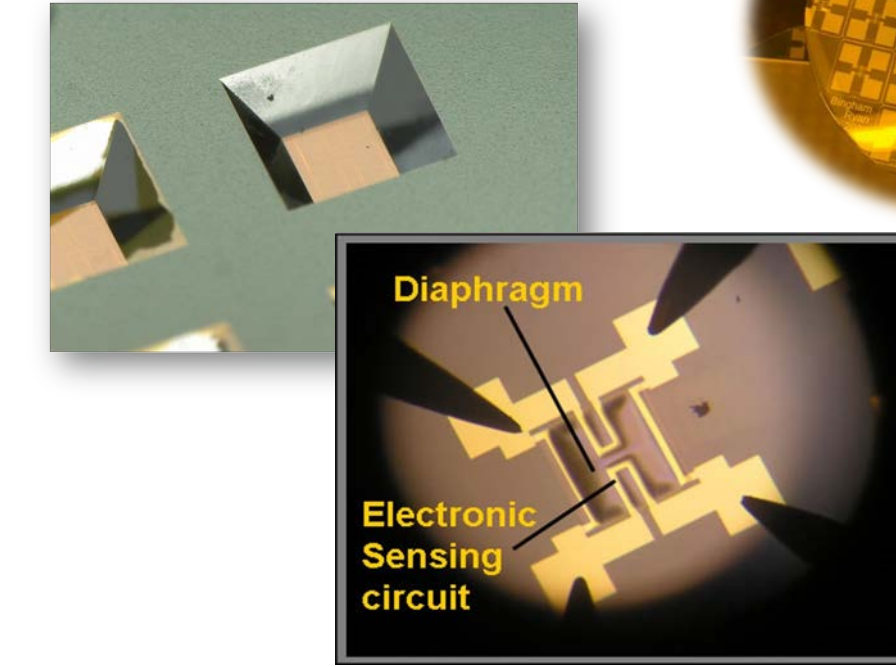


## ABSTRACT

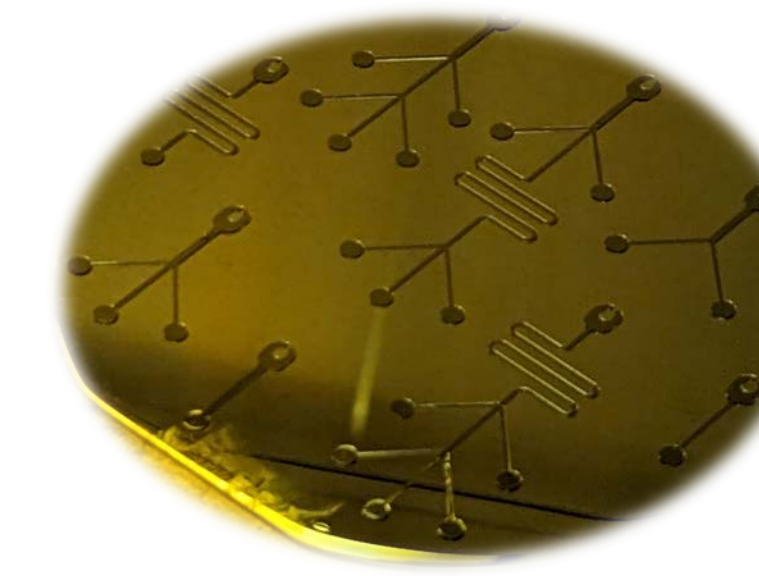
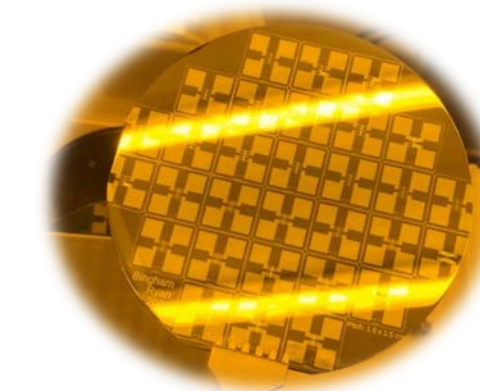
The Support Center for Microsystems Education and The Micro-Nano Technology Education Center work in collaboration to provide a multi-week microfabrication research experience at the University of New Mexico's Manufacturing Training and Technology Center (MTTC). This program is for community college students and offers practical hands-on experience in microfabrication techniques like photolithography, wet and dry etching, cleanroom safety, and the use of metrology tools for characterizing microstructures. The program culminates in a virtual poster session showcasing the students' findings, giving them an experience in presenting to others.

## Example Teaching Devices

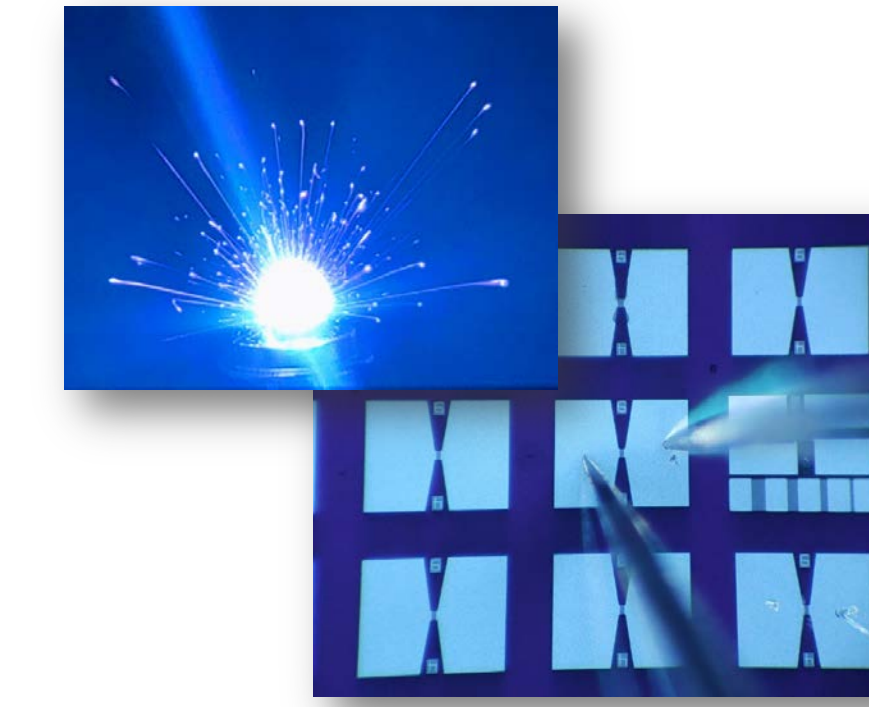
“Art Wafer”



Pressure Sensor



Micro Fluidics



Diodes/Initiators



## MTTC Process Equipment Students Learn

**Dry and Vapor Etch**  
Reactive Ion Etcher  
Deep Reactive Ion Etcher  
HF Vapor  
XeF2 Vapor Etch

**Photolithography**  
Resist Application - HMDS, Coaters, Bake  
Exposure - Karl Suss (1X), Microlight (Maskless)  
Develop Caustic Hood  
Solvent Strip Hood  
Soft Lithography

**Wet Etch & Clean**  
Buffered Oxide Etch  
Potassium Hydroxide Etch  
Piranha Clean  
Caustic and Solvent hoods  
Quick Dump Rinse  
Spin Rinse Dryers

**Deposition**  
Sputter - DC/RF/Pulsed  
Oxidation

**Metrology**  
Profilometer  
Scanning Electron Microscope  
Nanospec  
4pt Probe

**Electrical Characterization**  
Probe w/ Interference Curve Tracer  
O-scope  
Waveform Generator  
Power supply  
DVM

**Dicing and Packaging**  
ADT Dicer  
Wire Bonding  
Packaging

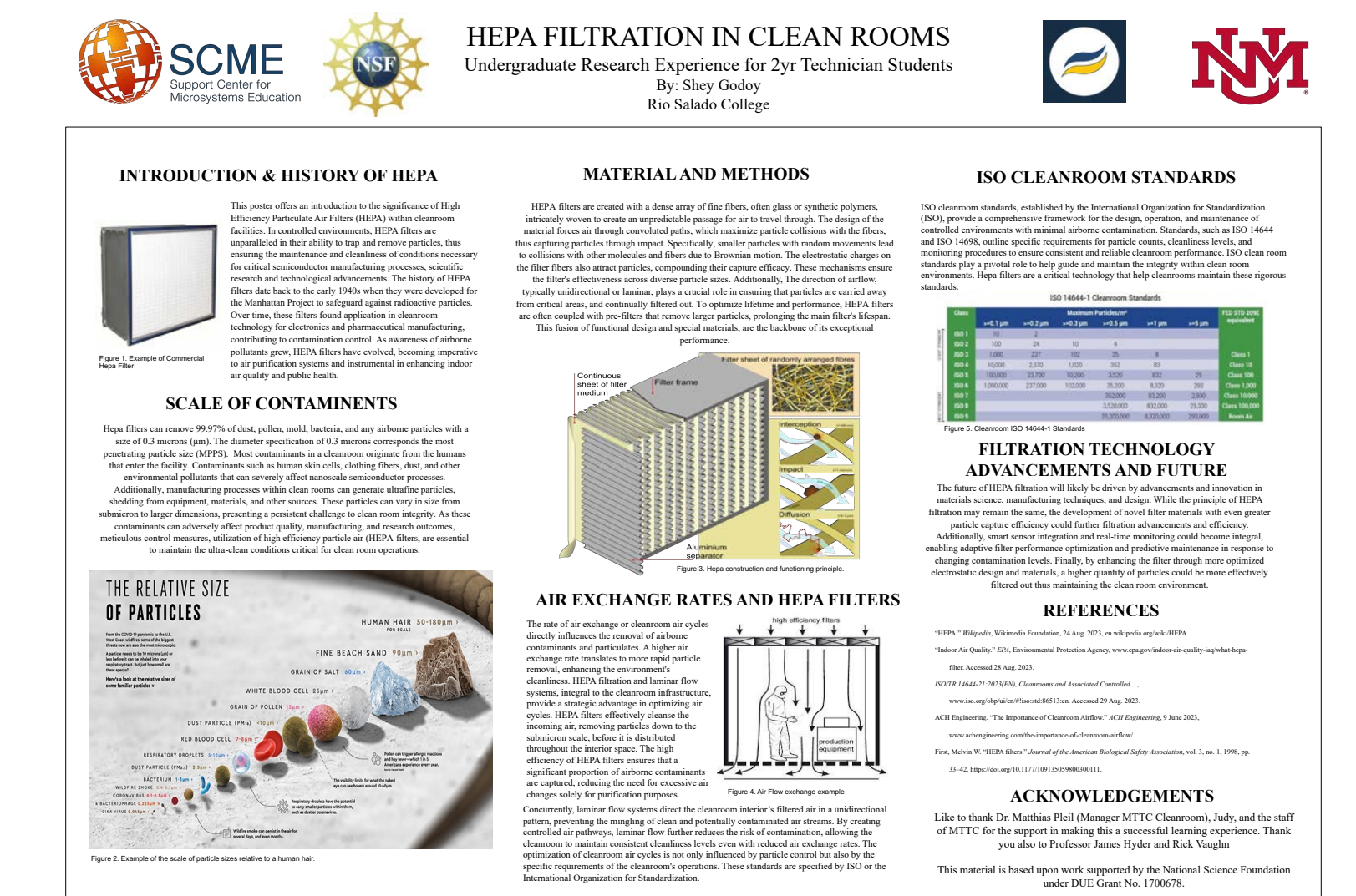
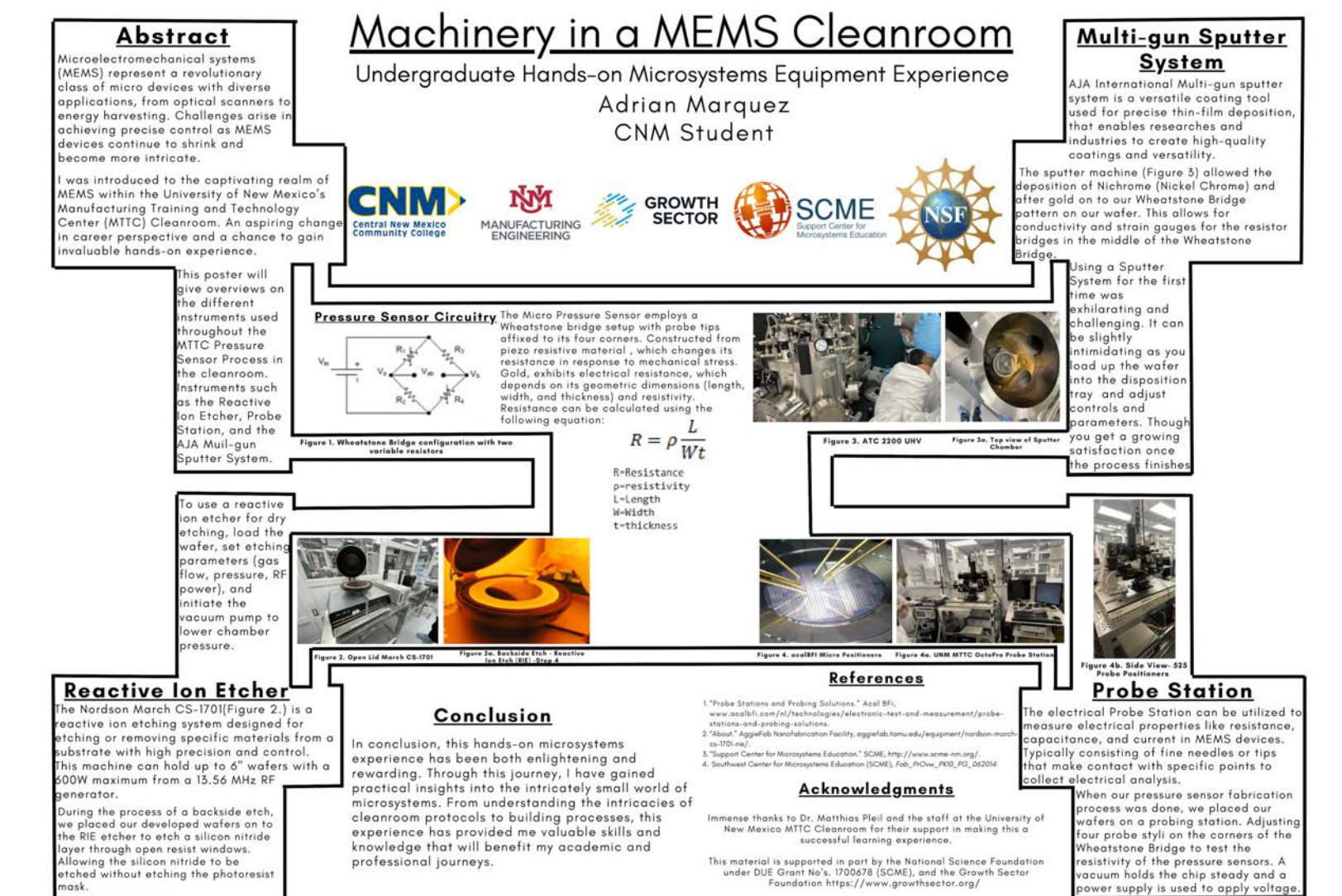
## Student Outcomes – Poster Presentations in Virtual Reality

### URE Program Overview

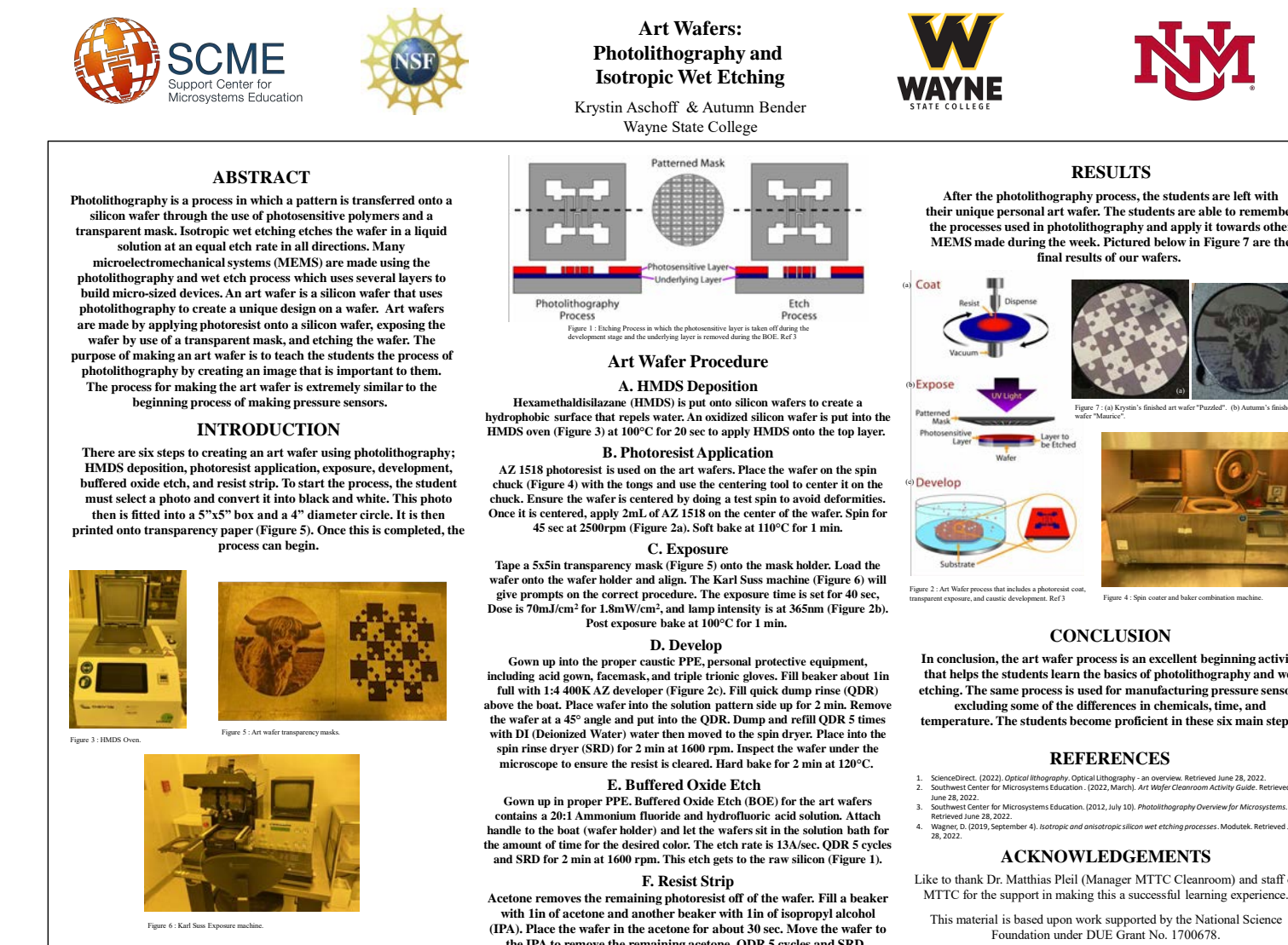
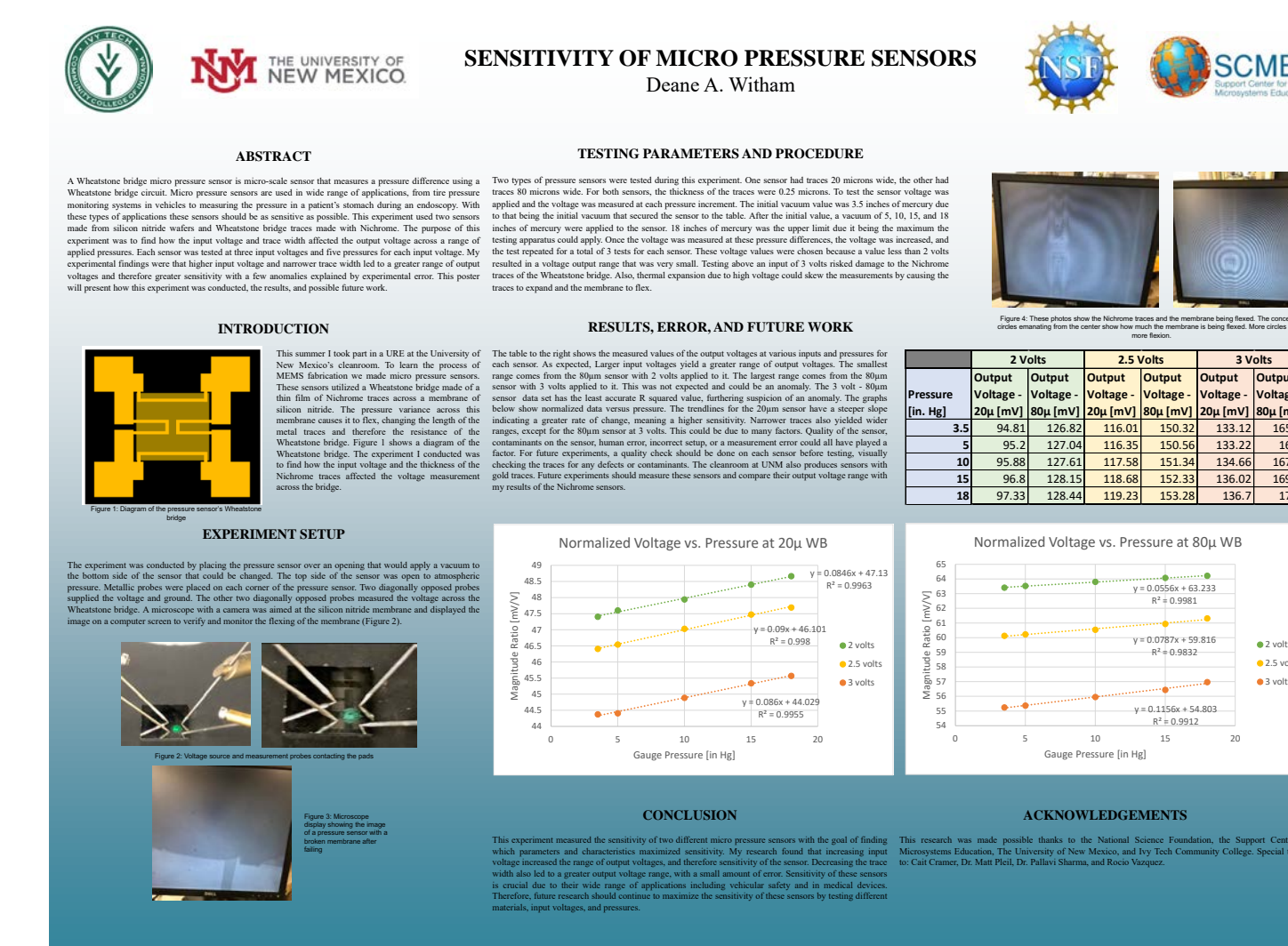
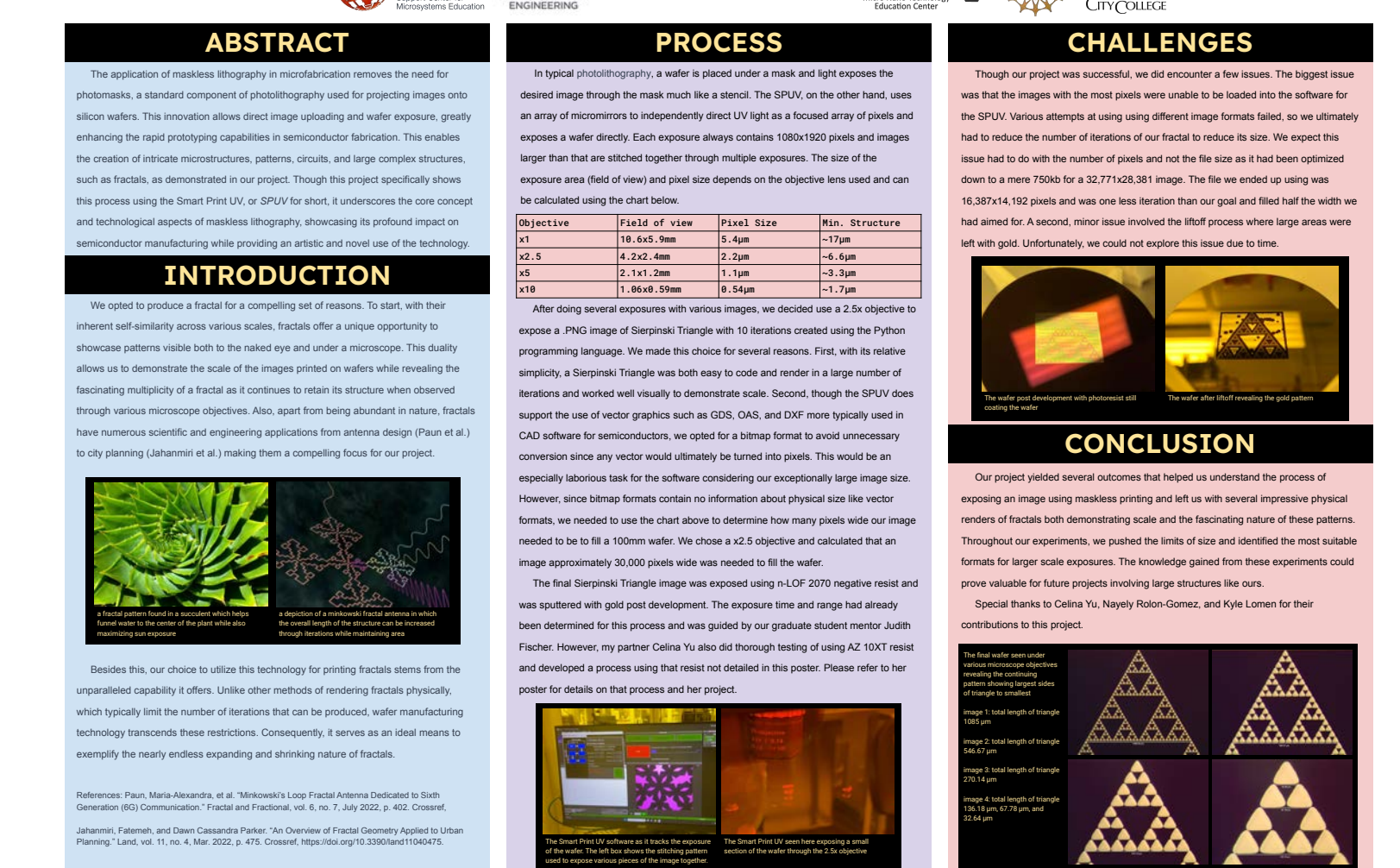
The Undergraduate Research Experience (URE) program equips students with essential knowledge, skills, and abilities in microfabrication processes and technologies. Key areas include:

- **Fabrication Techniques:** Students practiced photolithography, etching, sputter deposition, and reactive ion etching.
- **Materials and Processes:** Knowledge was gained in handling silicon wafers, thin film metal alloys, silicon oxide, silicon nitride, and photoresists, alongside associated modification and patterning techniques.
- **Cleanroom Protocols and Safety:** Training in cleanroom procedures ensured adherence to safety standards.
- **Measurement and Characterization:** Students used profilometers, scanning electron and optical microscopes, and thin film measurement tools for structure characterization.

Additionally, students presented their findings in a virtual online poster session.



## USING MASKLESS LITHOGRAPHY TO PRINT FRACTALS



## ACKNOWLEDGEMENTS

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