

# Rupak Mahapatra – Curriculum Vitae

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## Research Interests

### Experimental searches for dark matter through the SuperCDMS Cryogenic Dark Matter Search experiment

- Established a fully dedicated semiconductor detector fabrication facility for development of sophisticated cryogenic particle detector technologies. Our facility is playing the central role in developing detectors for the next generation SuperCDMS experiment in SNOLAB, Canada, having fabricated and delivered the first scientific payload for the experiment jointly funded by DOE and NSF. Our facility solved one of the biggest bottlenecks in the scale of the SuperCDMS cryogenic experiments, taking it from a cottage industry style detector development at Stanford to industrial class detector development using the fully dedicated fabrication facility with the cost reduced from more than \$0.5 million per kg to \$0.1 million per kg, driven by a significantly improved yield and lower costs at TAMU.
- Playing the key detector technology development role for the DOE New Initiative in Dark Matter (NIDM) program through the LBNL-led TESSERACT project. All prototype detector fabrications for this project are done at TAMU.
- Initiated and developed the SuperCDMS dark matter search program at TAMU and have grown it to 3 faculties.

### Founder and Spokesperson of the MINER coherent neutrino scattering

- Founded a leading reactor neutrino experiment - Mitchell Institute Neutrino Experiment at Reactor (MINER) - that leverages our ultra-low threshold detector technology and background reduction techniques to search for new physics through precision measurement of reactor neutrino interaction. Such low energy neutrinos also pose as the ultimate background for dark matter searches, thus breaking new grounds for both neutrinos and dark matter. The first generation of this experiment operated at the MW TRIGA reactor at TAMU; it is currently being relocated to the High Flux Isotope Reactor (HFIR) at the Oak Ridge National Laboratory, for a 100x faster search for new physics.

### Next-generation Cryogenic Detector Technology Development for Particle Physics and Quantum Information Sciences

- The Mahapatra group has established itself as the leading clearing house for new cryogenic detector technology development for a half a dozen National Labs (FNAL, SLAC, PNNL, LBNL, LLNL and ANL) and more than a dozen universities. Our expertise is highly sought after due to our niche combination of a dedicated low-background semiconductor fabrication facility, dedicated cryogenic characterization facility and quick R&D to science cycle in HEP experiments and QIS R&D. Our Transition Edge Sensors (produced for LBNL QIS program) has demonstrated the world-best energy resolution density of  $1 \text{ meV}/\sqrt{\mu\text{m}^3}$ .
- Innovative Magnetic Avalanche Detector using Single-Molecule Magnets**  
Our group is the first one to demonstrate magnetic avalanche in Single Molecule Magnet (SMM) induced by particle interaction that uses the Zeeman energy for magnetic deflagration, albeit at a higher energy scale than is useful for Dark Matter or Reactor Neutrino experiments, using  $^{12}\text{Mn}$  (an easily synthesized SMM) below its blocking temperature of 1.8K. This opens the possibility of exploring many SMMs with projected energy thresholds of  $< \text{eV}$  exploiting their large molecular magnetic moments and magnetic bistability.

## Education

- Ph. D.** University of Minnesota, Dec 2000 HEP Experiment on CLEO  $e^+e^-$  Collider  
*Thesis: Measurement of the Mass, Full Width and  $\gamma\gamma$ -Width of the  $\eta_c$  Meson using the CLEO*
- B. S.** Indian Institute of Technology, 1993 Chemical Engineering

## Employment and Experience

Professor	Texas A&M University	2017 -
Associate Professor	Texas A&M University	2013 - 2017
Assistant Professor	Texas A&M University	2008 - 2013

## Honors and Awards

## Rupak Mahapatra – Curriculum Vitae

- 2025 **Mitchell/Heep Endowed Chair in Experimental Particle Physics**
- 2024 **Chancellor EDGES Fellow for high impact research**
- 2021 **University-level Distinguished Achievement Award in Teaching by Associate of Former Students**
- 2020 **Association of Former Students College-level Distinguished Achievement Award**
- 2019 **Presidential Impact Fellow**
- 2019 **Appointed as Director of Research Engagement for the TAMUS National Labs Office**
- 2016 **Elected Spokesperson of the MINER coherent neutrino scattering experiment** – In recognition of providing leadership for the collaboration consisting of ~60 members from 11 universities in 4 countries.
- 2016 **Honorary Faculty at National Institute of Science and Education Research (NISER), India** – In recognition of involving them in SuperCDMS and collaborating on the long-term growth of a dark matter program in India
- 2012 **Adjunct Faculty at Saha Institute of Nuclear Physics (SINP), Calcutta** - In recognition of contributions to development of large underground lab in India and planning of a ton-scale experiment by end of the decade
- 2010 **DOE Early Career Award** – Funded to establish a fabrication facility suited for a ton-scale Germanium experiment. Title: “Ton-scale Ge: Beyond Zepto-barn WIMP Cross-section”
- 2009 **Received large donation (> \$3 million) of an entire 6-inch semiconductor fab line** – Through presentations, negotiations and family connection, received an entire industrial quality fab line donated for installation at TAMU

### Committee Membership, Scientific Service, etc

#### **DOE Early Career Awardee Network leadership**

Hosted the first ever HEP ECAN meeting at TAMU in June 2023. Have been spearheading a ECA mentoring program at TAMU since 2020, in collaboration with the Research Development Services. First success (Phil Adsley-23) in the 3rd year.

#### **DOE Super Panel Member 2022**

Committee responsible for selecting the HEP Early Career Awardees 2022

#### **NASA Astrophysics APRA+SAT21 Panel Member 2022**

#### **DOE Nuclear Physics Panel Member 2021**

#### **DOE Comparative Review Panel Member for Triennial Cosmic Frontier Review of DOE Labs in DC in July 2016**

Chosen by DOE to be a panel member reviewing the DOE labs research program in Cosmic Frontier for the next 3 years of funding. Labs include FNAL, SLCA, LBNL, BNL, ANL, LANL, LLNL, PNNL. Provided technical review of various research programs at various labs and how effective they were by themselves and in comparison, with other labs.

#### **Spokesperson of the MINER reactor neutrino experiment**

Elected to be the spokesperson of the MINER experiment in 2016

#### **Co-convenor of the 2015 CPAD workshop on New Technologies for Discovery at UT Arlington**

This conference will evaluate the detector R&D program being carried out in support of the HEP science mission, especially in support of the science drivers identified as high priority by the P5 panel.

### Selected Publications

#### **h-index: 76**

1. First Limits on Light Dark Matter Interactions in a Low Threshold Two Channel Athermal Phonon Detector from the TESSERACT Collaboration: <https://inspirehep.net/literature/2897108>
  2. First Measurement of the Nuclear-Recoil Ionization Yield in Silicon at 100 eV (SuperCDMS collaboration): <https://doi.org/10.1103/PhysRevLett.131.091801>
  3. Low energy backgrounds and excess noise in a two-channel low-threshold calorimeter (TESSERACT collaboration): <https://pubs.aip.org/aip/apl/article-abstract/126/10/102601/3339435/Low-energy-backgrounds-and-excess-noise-in-a-two>
  4. Phonon-mediated high-voltage detector with background rejection for low-mass dark matter and reactor coherent neutrino scattering experiments: <https://www.sciencedirect.com/science/article/abs/pii/S0168900222002467>
  5. First Leptophobic Dark Matter Search from the Coherent-CAPTAIN-Mills Liquid Argon Detector: <https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.129.021801>
  6. MINER Reactor Based Search for Axion-Like Particles Using Sapphire (Al<sub>2</sub>O<sub>3</sub>) Detectors: <https://inspirehep.net/literature/2916516>
  7. New Directions for Axion Searches via Scattering at Reactor Neutrino Experiments: <https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.124.211804>
- Full list: <https://inspirehep.net/literature?sort=mostrecent&size=25&page=1&q=find%20%20a%20mahapatra%2C%20>