# Dr. Arijita Mukherjee Chakraborty

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## WORK EXPERIENCE

### Co-founder; Consultant Physicist, Faculty and Mentor, Vector Educational and Consultancy Services (March 2020 - present).

- Co-founded an educational startup, aimed at providing the best-in-class physics education, with particular emphasis on problem solving, geared at preparing students for competitive exams from secondary to Master's level.
- Successfully mentored students from Secondary, Post-Secondary, Bachelor's, and Master's levels, with demonstrated excellence in competitive exams, with excellent student feedback.
- Managed technical and administrative roles.

### Yield Analysis Engineer, Intel Corporation, PTD Yield (February 2018-February 2020)

- Led critical projects aimed at designing failure analysis (FA) experiments and analyzing data to investigate the root cause of physical defects resulting in device failure for various process technology nodes.
- Designed experiments and data analysis methodologies to determine critical parameters that determine process health at key steps.

## EDUCATION

- Ph.D. (Physics), University of Illinois-Chicago (2017)
- Master of Science (M.Sc. Physics), Indian Institute Of Technology Madras (IIT Madras) (2012)
- Bachelor of Science (B.Sc. Physics Honors), University Of Calcutta (2010)

## RESEARCH EXPERIENCE

**Graduate Research Assistant, Nanoscale Physics Group, UIC**
Area of research: Materials science/ electrochemistry/ transmission electron microscopy
**June 2014 – December 2018**
**Advisor: Professor Robert F. Klie**

- PhD thesis project involved application of analytical transmission electron microscopy (*TEM*) techniques to investigate cathodes for battery systems, focusing on both lithium ion batteries, as well as *"beyond Li"* magnesium ion based batteries. Specifically, the goal was to study and directly prove ion intercalation in vanadium pentoxide polymorphs. The techniques employed included *in situ TEM* experiments with the open cell battery setup; high-resolution TEM (*HRTEM*), electron diffraction, aberration-corrected scanning transmission electron microscopy (*STEM*) imaging, electron energy loss spectroscopy (*EELS*), energy dispersive X ray spectroscopy (*EDX*), as well as *STEM* image simulations.

- In addition, graphene liquid cells were developed for *in situ* imaging/spectroscopy of nano-bio interfaces, as well as studying chemical/electrochemical reactions dynamically.

**Master's Thesis Project, IIT Madras**
Area of research: Experimental High-energy physics/ Data analysis using C++ and ROOT
**August 2011- May 2012**
Data from a prototype RPC detector was analyzed using C++ and ROOT to study the response of the RPC to cosmic muon hits. Muon tracks inside the detector were reconstructed using linear fitting and the efficiency of the RPC was calculated.

**Summer Project, University of Calcutta**

Area of research: Statistical mechanics/C programming
**May 2011-July 2011**
Analyzed simple one dimensional classical spin systems using the transfer matrix technique, simulated Pareto's law using kinetic theory assumptions following the econophysics formulation.

## RELEVANT COURSEWORK

Solid state physics, Quantum Mechanics, Electrodynamics, Transmission electron microscopy, Statistical Mechanics, Molecular biophysics, Matlab, Physics of semiconductor devices.

## TEACHING EXPERIENCE

- Taught physics to students from Secondary to Master's levels, with particular emphasis on problem solving, geared towards competitive exams, with extremely positive student feedback at Vector Educational and Consultancy Services.
- Taught labs and led discussion sections for undergraduate physics courses at University of Illinois-Chicago.
- Teaching Assistant (TA) coordinator of Physics 106 (undergraduate classical mechanics course) [Fall 2013; Spring 2014] at University of Illinois-Chicago.

## AWARDS AND HONOURS

**LAS PhD Student Travel Award (January 2016 and 2017)**
This travel award supported research presentation at APS March Meeting 2016 and 2017.

**Next Generation Electrochemistry (NgenE) workshop (June 2016)**
The participants were selected via a competitive application and screening process, and comprised of graduate students and postdocs from across United States. This five day intensive workshop consisted of lectures, lab tours as well as doing a short group project related to an important and open question in electrochemistry, which culminated in a group presentation and report at the end of the workshop.

**Scholarship for attending Winter School on High Resolution Electron Microscopy and Post School Course on Aberration corrected Electron Microscopy (January 2015)**
This competitive scholarship was awarded by Leroy Eyring Center for Solid State Sciences, Arizona State University to cover the cost of attending this workshop.

**Graduate Aptitude test in Engineering (GATE) (February 2012)**
All India rank 30 out of a total of 6317 test takers in Physics.

**Best All Rounder Student award from Lady Brabourne College, Kolkata (June 2010)**
This award is given annually to one student from the graduating batch of about 600 for demonstrating academic excellence along with accomplishments in extracurricular activities. I was selected for this award for the graduating batch of 2010 for excellent performance in Physics (honors) at the university level examinations and winning several inter college debate and elocution competitions throughout my 3 year tenure.

**INSPIRE scholarship by Department of Science and Technology, Government of India (August 2009)**

This prestigious scholarship of $5,200 over a period of 4 years was awarded to me for scoring within top 1% in $10^{th}$ grade and $12^{th}$ grade examinations and pursuing basic science education for my bachelor and masters level.

## SELECTED PUBLICATIONS

For a complete list of publications, please check:
https://scholar.google.com/citations?user=dAUbDQYAAAAJ&hl=en&oi=ao

J. Jokisaari, X. Hu, **A. Mukherjee**, V. Uskokovic, R.F. Klie, *Hydroxyapatite as a scavenger of reactive radiolysis species in graphene liquid cells for in situ electron microscopy*, *Nanotechnology*, **2021**, 32 485707.

I.D. Johnson, G. Nolis, L. Yin, H.D. Yoo, P. Parajuli, **A. Mukherjee**, J. L. Andrews, M. Lopez, R. F. Klie, S. Banerjee, B. J. Ingram, S. Lapidus, J. Cabana, Jawwad A. Darr., *Enhanced charge storage of nanometric* $\zeta - V_2O_5$ *in Mg electrolytes*, *Nanoscale*, **2020**.

N. Sa, **A. Mukherjee**, B. Han, Y. Ren, R. F. Klie, B. Key, J. T. Vaughey, *Direct observation of MgO formation at cathode electrolyte interface of a spinel* $MgCo_2O_4$ *cathode upon electrochemical Mg removal and insertion*, *J. Power Sources*, **2019**, 424, 68-75.

J. R. Jokisaari, J. Hachtel, X. Hu, **A. Mukherjee**, O. Krivanek, J. C. Idrobo, and R. F. Klie *Vibrational spectroscopy of water with High Spatial Resolution*, *Advanced Materials*, **2018**,1802702.

M. Asadi, B. Sayahpour, P. Abbasi, A. T Ngo, K. Karis, J. R Jokisaari, C. Liu, B. Narayanan, M. Gerard, P. Yasaei, X. Hu, **A. Mukherjee**, K. C. Lau, R. S. Assary, F. Khalili-Araghi, R. F Klie, L. A Curtiss, A. Salehi-Khojin, *A lithium–oxygen battery with a long cycle life in an air-like atmosphere*, *Nature*, **2018**, 555, 502.

J. Andrews, **A. Mukherjee**, H.D Yoo, A. Parija, P.M Marley, D.G Prendergast, J. Cabana, R.F Klie, S.Banerjee, *Reversible Mg ion insertion in a metastable one dimensional polymorph of* $V_2O_5$, *Chem*, **2018**, 4, 564 – 585.

**A. Mukherjee**, N. Sa, P. J. Phillips, A. Burrell, J. Vaughey and R. F. Klie, *Direct investigation of Mg intercalation into orthorhombic* $V_2O_5$ *cathode using atomic resolution transmission electron microscopy*, *Chem. Mater*. **2017**, 29, 2218-2226.

**A. Mukherjee**, H. A. Ardakani , T. Yi , J. Cabana , R.S. Yassar , R. F. Klie, *Direct characterization of the Li intercalation mechanism into* $\alpha$-$V_2O_5$ *nanowires using* in-situ *Transmission Electron Microscopy*, *Appl. Phys. Lett.* **2017**, 110, 213903.

## SELECTED CONFERENCE PRESENTATIONS

**A. Mukherjee**, H.D. Yoo, G. Nolis, J. Andrews, S. Banerjee, J. Cabana, R.F. Klie, *Systematic Transmission Electron Microscopy Study Investigating Lithium and Magnesium Intercalation in Vanadium oxide polymor*phs, **Platform Presentation**, **Microscopy and Microanalysis Conference**, August 6-August 10, 2017, St. Louis, MO,USA.

**A. Mukherjee**, G. Nolis, H.D. Yoo, J. Andrews, S. Banerjee, J. Cabana, R. F. Klie, *Systematic Electron Microscopy Study Investigating Mg Intercalation of Tunnel Structured* $\zeta$-

*$V_2O_5$ Polymorph*, **Platform Presentation**, **MRS Meeting**, April 17- April 21, 2017, Phoenix, AZ, USA.

**A. Mukherjee**, N. Sa, P. J Phillips, J. Andrews, S. Banerjee, A.K. Burrell, R.F. Klie, *Aberration corrected STEM and High Resolution EELS study Investigating Magnesium Intercalation in Vanadium Pentoxide Cathode*, **Platform Presentation**, **Microscopy and Microanalysis Conference**, July 24-July 28, 2016, Columbus, OH, USA.

**A. Mukherjee**, H.A. Ardakani, T. Yi, C. J. Kim, J. Andrews, S. Banerjee, J. Cabana, R.S. Yassar, R.F. Klie, *Transmission Electron Microscopy and First Principle Studies Investigating Intercalation Phenomenon Of Vanadium Pentoxide ($V_2O_5$) nanowire cathode*, **Platform Presentation**, **APS March Meeting**, March 14-March 18, 2016, Baltimore, MD, USA.

**A. Mukherjee**, H.A. Ardakani, T. Yi, J. Cabana, R.S. Yassar, R.F. Klie, *In situ Transmission Electron Microscopy Investigations into Intercalation of different cations into $V_2O_5$ nanowire cathode*, **Platform Presentation**, **ECS Meeting**, May 24- May 28, 2015, Chicago, IL, USA.

## OUTREACH ACTIVITIES

- Led science awareness and communication efforts at Vector Educational and Consultancy Services.
- Was part of interview panel for hiring in the Failure Analysis group at Intel Corporation, (2019-2020).
- Represented UIC Physics at APS March Meeting Graduate School fair (March 2017 and March 2016), interacting with prospective graduate students.
- Conducted lab tours for prospective physics graduate students at various times at UIC Physics.
- Co-chair, UIC Physics, Women in physics group, (2015-2017).
- Represented UIC Physics as a Science fair judge at Poe classical elementary school (2012).