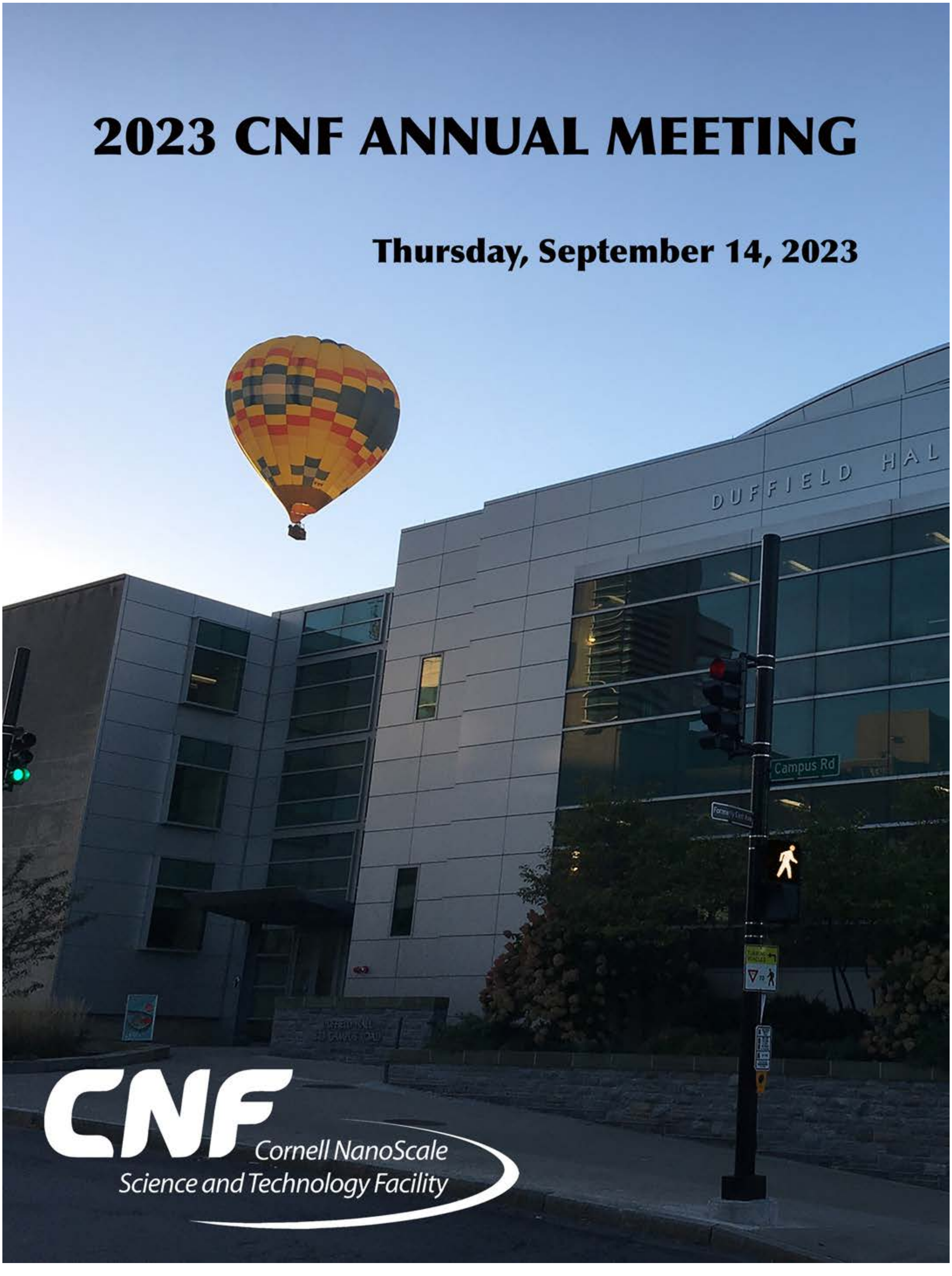
2023 CNF ANNUAL MEETING

Thursday, September 14, 2023



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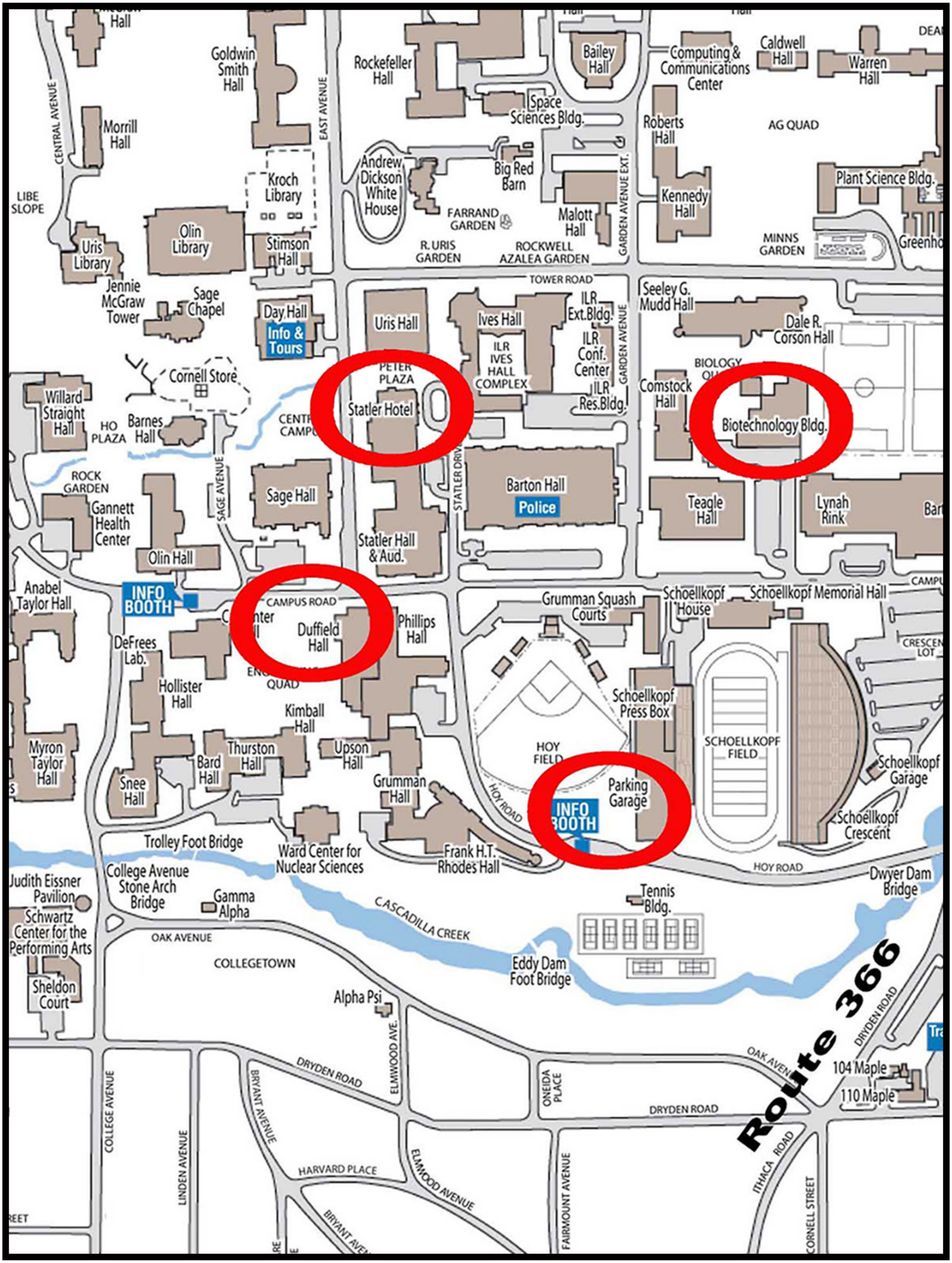
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REET

:: 2023 CNF ANNUAL MEETING ::

THURSDAY, SEPTEMBER 14, 2023

MORNING SESSION; BIOTECHNOLOGY BUILDING

8:00-8:45 a.m., Registration & Hot Breakfast Buffet (Biotech Atrium & G10 Biotech)

8:45-9:00, **CNF Directors' Welcoming Remarks** (G10 Biotech) 6
Judy Cha, Lester B. Knight Director, CNF
Ron Olson, Director of Operations, CNF

9:00-9:45, **Dr. Sophie V. Vandebroek**, Strategic Vision Ventures; 7
"Innovation Leadership" Keynote Interview on Stage
Moderated by **Prof. Alyssa B. Apsel**

9:45-10:00 Break

Session Chair: Tom Pennell II

10:00-10:15, **Dr. Robert Simmons III**;
Head of Social Impact and STEM Programs, Micron Foundation 8
"Current Workforce Development Activities at Micron Foundation"

10:15-10:30, **Bennett Cromer**; MSE, Cornell University (PI: Grace Xing) 9
"Oxide Materials and Devices"

10:30-10:45, **Gustavo Alvarez**; MAE, Cornell University (PI: Zhiting Tian) 10
"Cross-Plane Thermal Conductivity of h-BN Thin Films Grown by Pulsed Laser Deposition"

10:45-11:00, **Melody Lim**; Physics, Cornell University (PI: Itai Cohen) 11
"Programmable Nanomagnets for Microscopic Self-Assembly"

11:00-11:15 Break

Session Chair: Xinwei Wu

11:15-11:30, **Prof. James Hwang**; Materials Science and Engineering, Cornell University 12
"Sub-Terahertz Devices, Circuits, and Metrology"

11:30-11:45, **Wenwen Zhao**; AEP, Cornell University (PI: Debdeep Jena) 13
"Temperature Dependent Properties of the Ku-Band Epitaxial AlN FBARs"

11:45-12:00p, **Jack Crowley**; AEP, Cornell University (PI: Claudia Fischbach-Teschl) 14
"Exploring the 3D Genome of Breast Cancer in Unprecedented Detail"

12:00-12:15, **Thow Min Cham**; LASSP, Cornell University (PI: Dan Ralph) 15
"Exchange Bias Between Magnetic van der Waals Materials"

12:15-1:30 p.m., Lunch, Statler Ballroom

AFTERNOON SESSION; BIOTECHNOLOGY BUILDING

Session Chair: Christopher Alpha

1:30-1:45 p.m., Prof. Valla Fatemi; Applied and Engineering Physics, Cornell University 16
"Novel Superconducting Microwave Devices from 2D Materials"

1:45-2:00, Kathleen Smith; AEP, Cornell University (PI: Huili Grace Xing) 17
"Non-Alloyed Low Resistance Contacts to (010) β-Ga2O3 Enabled by Ga-Flux Polishing"

2:00-2:15, Jae Pil So; AEP, Cornell University (PI: Greg Fuchs) 18
"Integration of Quantum Emitters in SiC with Nanophotonic Structures"

2:15-2:30, Yihang Zeng; Physics, Cornell University (PI: Jie Shan) 19
"Fractional Chern Insulators in Twisted $MoTe_2$"

2:30-2:45, Hanyu (Alice) Zhang; AEP, Cornell University (PI: Nick Abbott) 20
"Chemically Driven Palladium Actuators"

2:45-3:00 Break

Session Chair: Michael Skvarla

3:00-3:15, Prof. Grace Xing; Electrical & Computer Engineering, Cornell University 21
"Insulator or Semiconductor? Lessons Learned from Wide Bandgap Semiconductors."

3:15-3:30, Yuming Robin Huang; MSE, Cornell University (PI: Chris Ober) 22
"Precise Control of Surface Morphology via Nanostructured Polypeptide Brushes"

3:30-3:45, Landon Ivy; ECE, Cornell University (PI: Amit Lal) 23
"Nanoscribe 3D Printed MEMS Devices"

3:45-4:00, Alyssa Shiyu Xu; MSE, Cornell University (PI: Judy Cha) 24
"Tailoring the Optical & Electrical Properties of MoTe2 via Electrochemical Intercalation of Li Ions"

4:00-5:00, CNF Clean Room Tours / Poster Set-Up

EVENING SESSION; DUFFIELD HALL ATRIUM

5:00-7:00 p.m.,
Poster Session & Corporate Soirée

(Poster Summaries begin on page 25)

CNF User Presentations and Poster Awards,
and the Nellie Yeh-Poh Lin Whetten Memorial Award, will be given out at 6:30 p.m.

The CNF Annual Meeting is supported by the following

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CNF DIRECTORS' WELCOME

Judy J. Cha is a professor in the Department of Materials Science and Engineering at Cornell University. She received her Ph.D. in Applied Physics from Cornell University in 2009 and did her post-doc research at Stanford University in the Department of Materials Science and Engineering.

Before joining Cornell in 2022, she was a faculty member in the Dept. of Mechanical Engineering and Materials Science at Yale University. She is a recipient of the SRC Young Faculty Award (2021), the Gordon & Betty Moore EPiQS Synthesis Investigator Award (2019), the NSF CAREER (2018), the Canadian Institute for Advanced Research (CIFAR) Azrieli Global Scholar for quantum materials (2017), the Yale Arthur Greer Memorial Prize (2016), and the IBM Faculty Award (2014).

In August of 2023, Judy was named the Lester B. Knight director of the Cornell NanoScale Facility.

Ron Olson, CNF Director of Operations (olson@cnf.cornell.edu) Ron has over 32+ years of progressive experience as an innovator in fab operations as well as process and device development. Prior to his new role at CNF, Ron was Manager of the SiC Technology Transfer Team for GE Global Research at SUNY Polytechnic Institute's Power Electronics Manufacturing Consortium (PEMC) where he provided technical direction and facilities/operational excellence for high volume manufacturing for next generation SiC power semiconductor devices. During his tenure at GE he served as Manager of the Wide Band Gap Process Engineering Team and Micro and Nano Fab Operations. Ron was responsible for the SiC engineering development and pilot production operations as well as management of a 28,000 sq. ft. Class 100 clean room supporting advanced research and development for a diverse range of technologies including: advanced packaging, wide band gap semiconductors, MEMS, photonics, photovoltaics and nanotechnology. Prior to joining GE in 2005, Ron was a founding member and Director of Fab Operations at Xanoptix, Inc., a start-up company specializing in next generation optical connections. In addition, he has held various Process Development and Engineering positions at Sanders, a Lockheed Martin Company, Quantum, and Raytheon's Research Division and Microwave Device Research Laboratory. Ron received a Bachelor of Science degree in Physics from Allegheny College and a Master of Science degree in Material Science and Engineering from Northeastern University.

Dr. Sophie V. Vandebroek

Strategic Vision Ventures, LLC
Founder & Owner
https://www.linkedin.com/in/sophievandebroek/

Interview on Stage: “Innovation Leadership”

Abstract

During an on-stage interview Sophie V. Vandebroek will share her career roadmap and the innovation leadership lessons learned along the way. She’ll touch on the importance of (1) creating strong relationships, (2) continuously getting your ticket punched, (3) not being afraid, (4) joining inclusive organizations and (5) having fun. Please come prepared with your questions for this seasoned executive with C-level experience at IBM, Xerox and UTC; and who has served on several not-for-profit and public company boards. She is a digital expert with deep knowledge in the creation and application of technologies and with a PhD in microelectronics from Cornell University.

Sophie V. Vandebroek , Ph.D.:

After a successful career in the technology industry, Dr. Vandebroek most recently founded her own company, Strategic Vision Ventures, where she shares the expertise she gained creating inclusive innovative organizations.

Sophie is the former Chief Operating Officer of IBM Research, and before that was Xerox’s Chief Technology Officer leading Xerox’s global laboratories, including Xerox PARC, Inc. Sophie served on the advisory council of the dean of engineering at MIT for over a decade and was the MIT’s Inaugural School of Engineering Visiting Scholar in 2020. She is a member of the Boards of Directors of IDEXX Laboratories the global leader in veterinary diagnostics and of Inari Agriculture, a high-tech Company focused on plant breeding technologies. Sophie also serves on the Supervisory Board of Wolters Kluwer. She is a trustee at the Boston Museum of Sciences and serves as a member of the international advisory board of the Flanders AI Research Program. Recently she was appointed Honorary Professor at the KU Leuven Faculty of Engineering Sciences. Sophie is a Fellow of the Belgian-American Educational Foundation and a Fellow of the Institute of Electrical & Electronics Engineers. She was inducted into the Women in Technology International Hall of Fame and elected into the Royal Flemish Academy for Arts & Sciences. Sophie’s passion for creating inclusive organizations where innovation thrives has earned her many awards among which is Xerox’s Inaugural Lifetime Diversity Leadership Award of Distinction.

Sophie earned a master’s degree in Engineering from KU Leuven, Belgium and has a Ph.D. in Electrical Engineering from Cornell University, Ithaca, New York.

Interview Moderator, Prof. Alyssa B. Apsel

Alyssa Apsel received a B.S. from Swarthmore College in 1995 and Ph.D. from Johns Hopkins University in 2002. She joined Cornell University in 2002, where she is currently a Professor of Electrical and Computer Engineering (ECE). She is also a Visiting Professor at Imperial College in London working on RF interfaces for implantable electronics. Apsel became the Director of ECE in July 2018 and was elected the IBM Professor of Engineering by the College of Engineering in 2023.

Robert Simmons III, EdD

Head of Social Impact and STEM Programs
Micron Foundation
robertsimmon@micron.com
https://www.micron.com/gives

Current Workforce Development Activities at Micron

Robert Simmons III, EdD is the Head of Social Impact and STEM Programs for Micron Technology, and a Scholar in Residence and Scholar of Antiracist Praxis in the doctoral program (educational policy and leadership department) at American University. As a noted scholar on STEM equity, urban education and race, Dr. Simmons teaches doctoral courses on race & racism in society and schools, as well the ways in which social media is a tool for activists and movement building. As a member of the Diversity Scholars Network at the National Center for Institutional Diversity at the University of Michigan, Robert ,Äòs research for the last 15 years has focused on racial equity in STEM and the lived realities of historically marginalized communities across multiple K-12 contexts. More specifically, he explores the experiences of Black students and teachers, equity in STEM, as well as the lived experiences of Black fathers.

Dr. Simmons is a partner in the nationally recognized DEI firm,ÄîEquity and Beyond, a blogger with Philly,Äôs 7th Ward, and a co-host of the 3XDope Podcast. Robert has delivered workshops and keynotes throughout the United States and Europe, and been featured on CNN, the Kojo Nnamdi Show (DC), the Marc Steiner Show (Baltimore) and the Pulse with Karen Dumas (Detroit),Äîas well as other media outlets in Detroit, Los Angeles and Washington DC.

A former middle school science teacher in the Detroit Public Schools, Robert was nominated twice as the Walt Disney National Teacher of the Year and once for the Whitney and Elizabeth MacMillan Foundation Outstanding Educator Award. As a fellow with the Woodrow Wilson Fellowship Foundation and the Fulbright Memorial Fund, Robert traveled to Costa Rica and Japan to study educational systems and conduct environmental research in the rainforest.

Currently, Robert serves on the boards of the Latinx Education Collaborative, and Reaching At Promise Students Association. Selected for the Outstanding Alumni Award from the College of Education and Human Development at Western Michigan University and the BE Modern Man Award from Black Enterprise, Robert has dedicated over 20 years of his professional life to supporting urban youth, their families and the community.

Gallium Oxide Power Diodes

Author(s): Bennett Cromer, Cameron Gorsak, Wenwen Zhao, Lei Li, Wenshen Li, Kathleen Smith, Katie Gann, Kazuki Nomoto, Nolan Hendriks, Andy Green, Kelson Chabak, Hair Nair, James C. Hwang, Bruce Van Dover, Michael Thompson, Debdeep Jena, Grace Huili Xing

CNF Project #: 280219

CNF Project PI: Grace Xing

Department and Institution: Materials Science and Engineering, Cornell University

Contact: bjc326@cornell.edu

Primary CNF Tools Used: AS200 Stepper, PT770 Etcher, AG610b RTA, Odd-Hour Evaporator

Abstract

β-Ga_2O_3 is an actively studied material for high power devices, largely due to its high breakdown electric field of 8 MV/cm, moderate electron mobility, and commercially available substrates. Over the past several years, we have investigated several modular processes necessary to increase key figures of merit for Ga_2O_3 devices. Namely, we have investigated the operational frequency windows of compensating dopants, high-field stability in Schottky diodes, novel p-n heterojunctions to Ga_2O_3, and optimization of high-k dielectric layers. In these efforts, we identified key shortcomings of a popular deep acceptor dopant, observed electric fields exceeding 6 MV/cm in a metal-semiconductor junction, developed Li-doped Mist-CVD epitaxial NiO alloys, and demonstrated high-throughput investigation of dielectric constant-frequency-leakage characteristics of common Titanates.

Cross-Plane Thermal Conductivity of *h*-BN Thin Films Grown by Pulsed Laser Deposition

Author(s): Gustavo A. Alvarez

CNF Project Number: 275819

Principal Investigator(s): Zhiting Tian

Affiliation(s): Sibley School of Mechanical and Aerospace Engineering,
Cornell University

Contact: gaa78@cornell.edu

Website: https://ztgroup.org/

Primary CNF Tools Used: SC4500 Odd-Hour Evaporator, P7 Profilometer, AFM - Veeco Icon

Abstract:

The distinguished properties of hexagonal boron nitride (*h*-BN), specifically its atomically smooth surface, large critical electric field, and large electronic bandgap, make it ideal for thin film microelectronics and as an ultrawide bandgap semiconductor. Owing to weak van der Waals interactions between layers, *h*-BN exhibits a significant degree of anisotropic thermal conductivity. The in-plane thermal conductivity of *h*-BN has extensively been studied, yet the only measured data of cross-plane thermal conductivity ($k\perp$) are for exfoliated *h*-BN films. Exfoliation from bulk crystals is not a sustainable method for scalable production of *h*-BN due to its low repeatability, low yield, poor control of sample thickness, and limitation to small areas. Thus, it is necessary to investigate the thickness-dependence of $k\perp$ for thin films grown by a practical growth method, such as pulsed laser deposition (PLD), which enables the production of reliable and large-area *h*-BN films with a control of film thickness. We grew *h*-BN using PLD at 750°C and observed a decreasing trend of $k\perp$ as thickness increases from 30 to 300 nm, varying from 1.5 to 0.2 W/(m K). We observed a relatively high $k\perp$ value for *h*-BN at a thickness of 30 nm, providing insight into the $k\perp$ of PLD-grown films suitable for electronics applications.

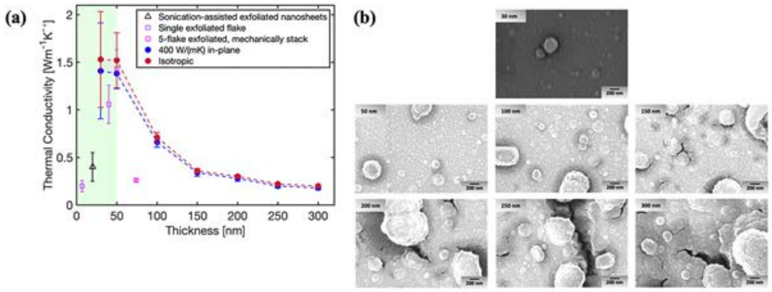


Figure 1: Thickness-dependent thermal conductivity and SEM of h-BN films. (a) As the thickness of the thin film increases there is a decrease in sample quality, thus, reducing k⊥ (b) Crack propagation is evident as the thickness increases leading to an increase in phonon defect scattering.

Programmable NanoMagnets for Microscopic Self-Assembly

Authors: Melody Xuan Lim, Zexi Liang, Conrad Smart, Itai Cohen, Paul L. McEuen

CNF Project Number: 296421

CNF Project PIs: Itai Cohen, Paul L. McEuen

Department and Institution: Kavli Institute at Cornell for Nanoscale Science, School of Applied and Engineering Physics, Laboratory of Atomic and Solid-State Physics, Department of Physics, Cornell University

Contact: mxl3@cornell.edu

Primary CNF Tools Used: Oxford 81/82 etcher, YES EcoClean Asher, ASML DUV stepper, Gamma Automatic Coat-Develop Tool, JEOL 6300 EBL, SC 4500 odd-hour evaporator, AJA Sputter Deposition, Heidelberg DWL2000, PT770 etcher (left side), Unaxis 770 Deep Silicon Etcher, Plasma-Therm Takachi HDP-CVD, Oxford PECVD, Oxford ALD, Zeiss SEM, Veeco AFM.

Abstract:

We develop an experimental platform for programmable microscopic magnetic self-assembly. We manufacture these microparticles at the wafer-scale, with the ability to precisely design shapes, magnetic moments, and magnetic interactions. Once released, we drive particles to explore their configuration space by a rotating magnetic field, generating chaotic flows that mix particles and drive assembly at the air-water interface. As a first example, we control self-limiting assembly by designing the shape and net magnetic moment of clusters at various stages in the assembly process. In particular, we show that spontaneous decoupling of the final product from the reaction forms a powerful principle for self-limiting assembly.

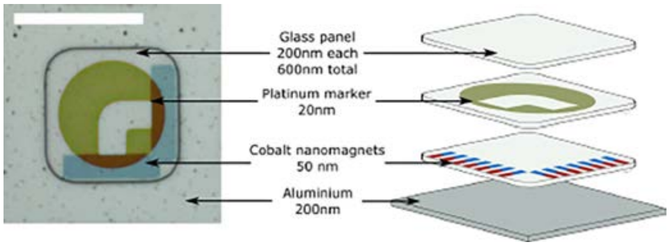
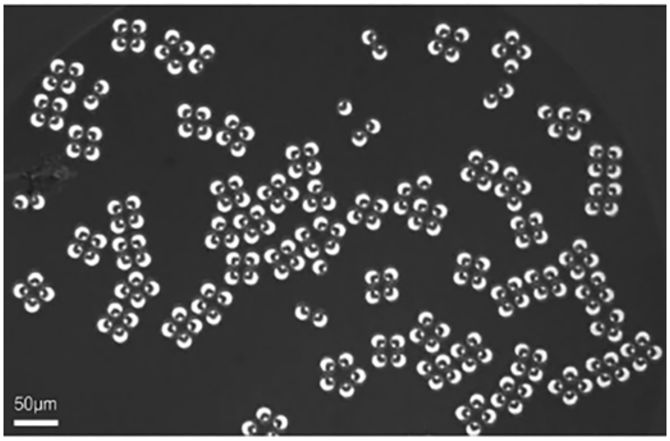


Figure 1, above: Schematic and optical microscope image of magnetic device layer structure. Figure 2, right: Optical microscope image of the product of several cycles of magnetic cyclic driving, where almost all panels have assembled into tetramers.



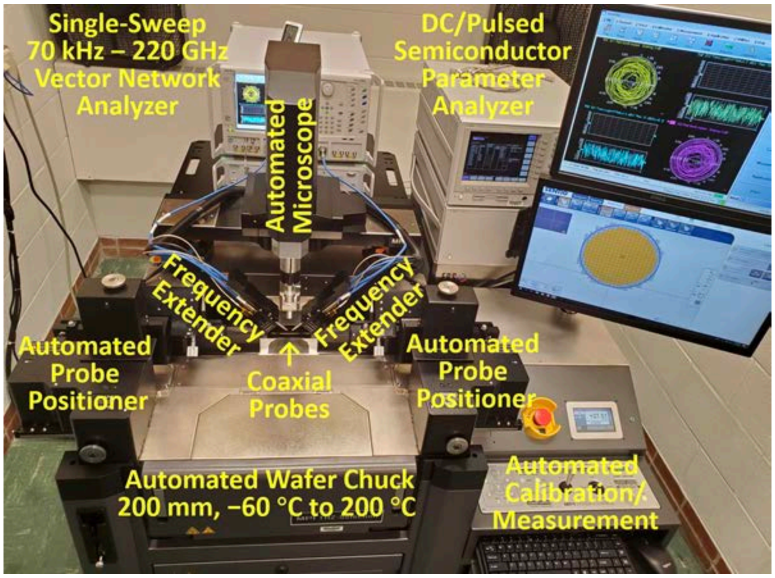
Prof. James C. M. Hwang

Department of Materials Science and Engineering,
Cornell University • jch263@cornell.edu

Sub-Terahertz Devices, Circuits, and Metrology

Abstract

This is the first report of a distributed amplifier (DA) realized through monolithic integration of transistors with a substrate-integrated waveguide (SIW). The DA uses a stepped-impedance microstrip line as the input divider like in conventional DAs, but uses a low-loss, high-power-capacity SIW as the output combiner. The input signal is distributed to four GaN high-electron mobility transistors (HEMTs) evenly in magnitude but with the phase successively delayed by 90° at the fundamental frequency. The HEMTs are separated by a half wavelength at the second harmonic frequency in the SIW, so that their outputs are combined coherently at the SIW output. To overcome the limited speed of the GaN HEMTs, they are driven nonlinearly to generate second harmonics, and their fundamental outputs are suppressed with the SIW acting as a high-pass filter. Using CNF's unique single-sweep 70-kHz-to-220-GHz probe station for both small-signal and large-signal analysis, the measured small-signal characteristics of the DA agree with that simulated, but the measured large-signal characteristics exceeds that simulated. For example, under an input of 68 GHz and 15 dBm, the output at 136 GHz is 38-dB above that at 68 GHz. Under an input of 68 GHz and 20 dBm, the output at 136 GHz is 14 dBm, with a conversion loss of 6 dB and a power consumption of 882 mW. This proof-of-principle demonstration opens the path to improving the gain, power and efficiency of DAs with higher-performance transistors and drive circuits. Although the demonstration is through monolithic integration, the approach is applicable to heterogeneous integration with the SIW and transistors fabricated on separate chips.



James Hwang is a professor in the Department of Materials Science and Engineering at Cornell University. He graduated from the same department with a Ph.D. degree. After years of industrial experience at IBM, Bell Labs, GE, and GAIN, he spent most of his academic career at Lehigh University. He cofounded GAIN and QED; the latter became the public company IQE and remains the world's largest compound-semiconductor epitaxial wafer supplier. He has been a consultant for the US Air Force Research Laboratory since 1989. He was a Program Officer at the U.S. Air Force Office of Scientific Research for GHz-THz Electronics. He was a visiting professor at Cornell University in the US, Marche Polytechnic University in Italy, Nanyang Technological University in Singapore, National Yang Ming Chiao Tung University in Taiwan, and Shanghai Jiao Tong University in China. He is an IEEE Life Fellow and an editor for the IEEE Transactions on Microwave Theory and Techniques. He has published approximately 400 refereed technical papers and been granted eight U.S. patents. He has researched the design, fabrication and characterization of electronic, opto-electronic, and micro-electromechanical devices and circuits. His current research focuses on materials and devices above 110 GHz for 6G wireless communications.

Temperature Dependent Properties of Ku-Band Epitaxial AlN FBARs

Authors: Wenwen Zhao, Rishabh Singh, Jimy Encomendero, Kazuki Nomoto, Lei Li, James C. M. Hwang, Huili Grace Xing, and Debdeep Jena

CNF project number: 280119

CNF principal investigators: Debdeep Jena, Huili Xing

Department and institution: Applied and Engineering Physics, Cornell University

Contact: wz344@cornell.edu

Primary CNF tools used: ABM/SUSS MA6 contact aligner, E-beam evaporator, AJA sputter, AJA ion mill, Arradiance ALD, SEM, AFM, PT770 etcher, Oxford Cobra ICP etcher, Electroplating hood

Abstract:

In this work, by taking advantage of the Ku-band epitaxial-AlN FBARs, we performed temperature-dependent (79-400 K) small signal measurements on the devices to understand the temperature dependence of the stiffness constant, longitudinal acoustic phase velocity of the piezoelectric material. The utilization of the equivalent circuit model (modified Butterworth-Van-Dyke model) enables extraction and analysis of different loss terms (e.g. electrical loss, acoustic attenuation and dielectric loss). The study of loss mechanisms of FBARs pointed out the limiting factors of scaling FBARs into > 20 GHz regime. Furthermore, a transition between Akhieser dissipation and Landau-Rumer dissipation was observed at cryogenic temperatures.

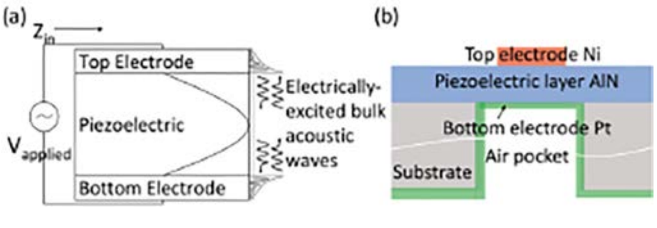


Figure 1, top: (a) Cross-sectional figure of the M-I-M FBAR structure. Electrical signals transform into acoustic vibration due to reverse piezoelectric effect. (b) Design of an epitaxial AlN FBAR suspended from the substrate. In this work, the substrate is SiC.

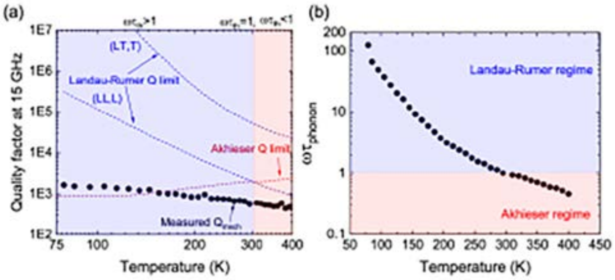
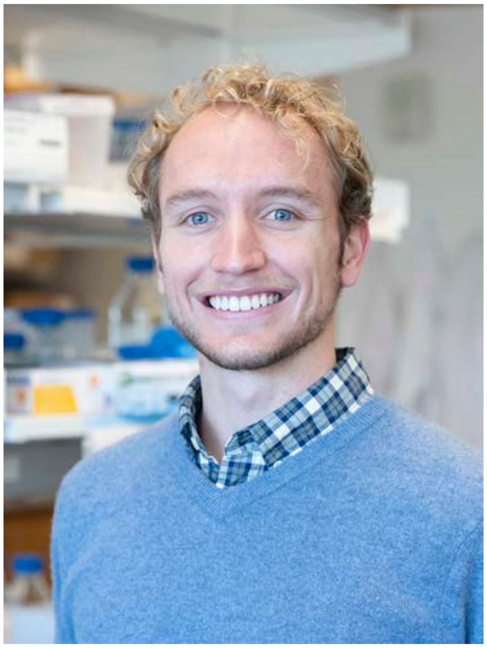


Figure 2, bottom: (a) Temperature dependence of the quality factor Qmech along with the quality factor limits predicted in Akhieser regime and Landau-Rumer regime. (b) Temperature dependence of the life time of the thermal phonon in wurzite AlN.

Exploring the 3D Genome of Breast Cancer in Unprecedented Detail



**Authors: Jack Crowley, Thomas Roberts,
Eryka Kairo, Mitchell Woodhouse,
Claudia Fischbach-Teschl, Warren Zipfel**

CNF Project #: 142506

CNF Project PI: Warren Zipfel

Department and Institution: Applied & Engineering Physics, Cornell University

Contact: jcc453@cornell.edu

Website: https://fischbachlab.bme.cornell.edu/

Primary CNF tools: Heidelberg mask writer DWL2000, mask etch Hamatech, dump rinser, piranha Hamatech, class II spin coaters, class II hot plates, class II fume hoods, ABM contact aligner, P7 profilometer

Abstract:

The health and behavior of the human cell is intricately controlled by transcription of two meters of DNA packed into a ~300 femtoliter nucleus. The nucleus is extremely organized, with multi-scale partitioning of genomic regions and patterns of DNA state that regulate the cell's behavior. These organizational principles within the nucleus are often perturbed in diseased cells, so we are investigating this form-function relationship in models of breast cancer. Following the development of an optical imaging-guided DNA extraction and sequencing method, named "Femto-seq" for its fundamental sub-femtoliter spatial resolution, we believe new types of measurements can be made, which bridge spatial and genomic contexts of transcriptional regulation.

As we ask how the perturbed 3D nucleus facilitates disease-promoting transcriptional instabilities, our need for optimized DNA purification has directed our attention towards the benefits of nanofabrication-enabled microfluidic sample manipulation.

Combining Cornell's world-class expertise and facilities in optical imaging, photolithography and microfluidics fabrication distributed between Weill Hall and Duffield Hall, we are now conducting extremely sensitive measurements of breast cancer's disordered genome.

Exchange Bias between van der Waals Materials: Tilted Magnetic States and Field-Free Spin-Orbit-Torque Switching

Author(s): Cham, T.M.J., Dorrian, R.J., Zhang, X.S., Dismukes, A.H., Chica, D.G., May, A.F., Roy, X., Muller, D.A., Ralph, D.C. and Luo, Y.K.

CNF Project #:598-96

CNF Project PI: Dan Ralph

Department and Institution: LASSP Cornell University

Contact: tc676@cornell.edu

Primary CNF Tools: Supra SEM, Nabity, AJA Sputter Deposition, Odd hour evaporator, Angstrom evaporator

Abstract

Magnetic van der Waals heterostructures[1] provide a unique platform to study magnetism and spintronics device concepts in the two-dimensional limit. Here, we report studies of exchange bias[2,3] from the van derWaals antiferromagnet CrSBr acting on the van der Waals ferromagnet Fe3GeTe2 (FGT). The orientation of the exchange bias is along the in-plane easy axis of CrSBr, perpendicular to the out-of-plane anisotropy of the FGT, inducing a strongly tilted magnetic configuration in the FGT. Furthermore, the in-plane exchange bias provides sufficient symmetry breaking to allow deterministic spin-orbit torque switching of the FGT in CrSBr/FGT/Pt samples at zero applied magnetic field.[4]

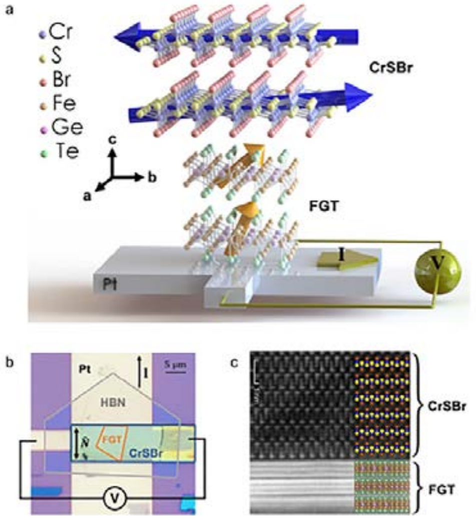
References

[1] Mak, K.F., et al., 2019. Probing and controlling magnetic states in 2D layered magnetic materials. Nature Rev Phys 1(11).

[2] Meiklejohn, W.H., et al., 1956. New magnetic anisotropy. Physical review, 102(5), p.1413.

[3] Zhu, R., et al., 2020. Exchange bias in van der Waals CrCl3/Fe3GeTe2 heterostructures. Nano Letters, 20(7), pp.5030-5035.

[4] Cham, T., et al., 2023. Exchange bias between van der Waals materials: tilted magnetic states and field-free spin-orbit-torque switching. arXiv preprint arXiv:2306.02129.



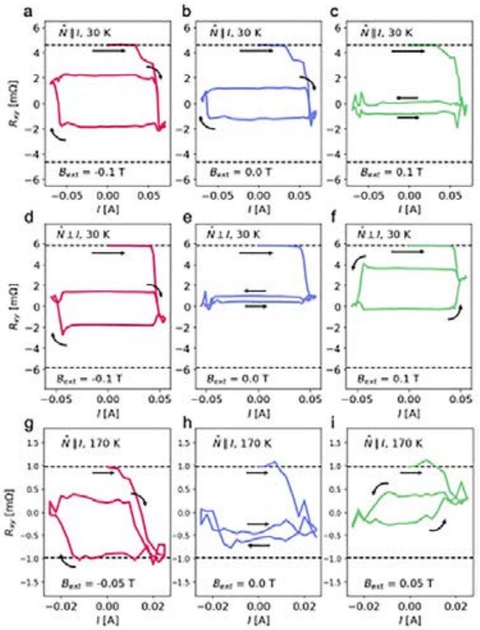


Figure 1, top; Device schematic and crystal structure (a) Schematic of a CrSBr/FGT heterostructure dry transferred onto a Pt channel for spin-orbit torque pulse current switching measurements. (b) Top-view optical image of the CrSBr(30 nm)/FGT(9 nm)/Pt (10 nm) device with the b crystal axis of the CrSBr layer oriented parallel to the current (so that N||I). (c) HAADF STEM cross-sectional image of the vdW interface of a different CrSBr/FGT heterostructure. Figure 2, bottom: Pulsed-current-switching hysteresis loops of CrSBr/FGT/Pt samples. (a-c) Pulsed-current switching hysteresis loops at 30 K for the sample with N || I. The uniaxial exchange bias field enables deterministic spin-orbit-torque switching within the FGT layer at 0 T (panel (b)). (c) With a positive field of 0.1 T, the magnetization reversal hysteresis is quenched. (d-f) Pulsed current switching hysteresis loops at 30 K for the sample with N⊥I. (g-i) Pulsed-current switching hysteresis loops at 170 K, for the device with N || I.

Prof. Valla Fatemi

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Andreev Dots: A New Type of Quantum Dot that Carries Supercurrent

Abstract:

In this brief talk, I will introduce a novel kind of quantum dot, which here I dub the Andreev dot. Like conventional quantum dots, these dots host discrete quantum states related to filling by electrons. Unlike conventional quantum dots, electric charge is not conserved, which is due to the fact that the confinement comes from a superconductor rather than an insulator. These quantum states (Andreev bound states) have the additional feature that they mediate the flow of dissipationless currents, which opens new avenues for connectivity between discrete quantum states. In this talk, I will give a brief introduction to Andreev dots and their potential niche in quantum information applications.

Biography:

Valla received his Ph.D. in Physics in the group of Pablo Jarillo-Herrero at the Massachusetts Institute of Technology in 2018. There he worked on electronic and quantum transport in topological insulator materials, including co-leading the team that discovered superconductor and topological insulator states in monolayer WTe2. He also worked closely on the project that discovered superconductivity and correlated insulator states in magic angle twisted bilayer graphene. He then joined the group of Michel Devoret at Yale University as the post-doctoral associate on the teams researching the physics of Andreev bound states and non-equilibrium quasiparticles in superconducting devices, including the recent unveiling of the Andreev spin qubit. Independently, he has been investigating parallels in the physics of Andreev levels and quantum circuits built from Josephson tunnel junctions. He recently joined the faculty of the School of Applied and Engineering Physics at Cornell University and is building a lab researching the physics of quantum materials, superconducting quantum circuits, and their intersections.

Non-Alloyed Low Resistance Contacts to (010) β-Ga_2O_3 Enabled by Ga-Flux Polishing

Author(s): Kathleen Smith, C. Gorsak, A. Kalra, K. Azizie, D. Schlom, D. Jena, H. Nair, H.G. Xing

CNF Project #: 280219

CNF Project PI: Huili Grace Xing

Department and Institution: School of Applied and Engineering Physics, Cornell University

Contact: kts57@cornell.edu

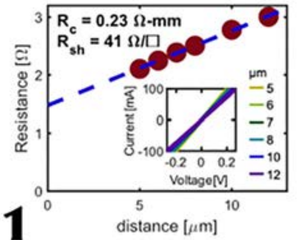
Primary CNF Tools: Angstrom E-Beam Evaporator, SC4500 Odd-Hour Evap, ABM Contact Aligner, SAMCO UV-Ozone, PT770

Abstract:

β-Ga_2O_3 has attracted interest in recent decades as a wide bandgap semiconductor (4.5-4.9 eV) for high voltage radio-frequency (RF) applications. However, high speed applications require low device on-resistance, which critically includes the resistance from the electrical contacts. Due to Fermi-level pinning and lack of low work-function metals, ohmic contact formation to wide bandgap semiconductors is difficult. While heavily doped regions can be used to form tunnel junctions for effective ohmic contacts, formation of such junctions is nontrivial. We observe that formation of traditional Ti/Au contacts formed to (010) β-Ga_2O_3 using conventional liftoff processing results in inconsistent current-voltage characteristics.

In this talk, low resistance non-alloyed ohmic contacts are realized by a metal-first process on homoepitaxial, heavily n+ doped (010) β-Ga_2O_3 that exhibit nearly linear ohmic behavior even without a post-metallization anneal and have a contact resistance (Rc) as low as 0.23 Ω-mm (Fig. 1). The metal-first process was successfully applied to reliably form non-alloyed contacts on n+ (010) β-Ga_2O_3 grown by both metal-organic chemical vapor deposition (MOCVD) as well as suboxide molecular beam epitaxy (MBE).

Identical contacts fabricated on similar MOCVD samples by conventional liftoff processing exhibit highly rectifying Schottky behavior (shown in blue in Fig. 2). Re-processing using the metal-first process after removal of the poor contacts by conventional methods does not improve the contacts (shown in dark blue in Fig. 2); however, addition of a Ga-flux polishing step followed by re-processing using a metal-first process again results in low resistance, nearly linear ohmic contacts (shown in yellow in Fig. 2). This suggests that during the initial liftoff processing, a detrimental layer may form at the interface that is not removed during the contact removal process but that can be removed by Ga-flux polishing. Finally, X-ray photoelectron spectroscopy (XPS) is used to investigate the chemical composition at the contact interface.



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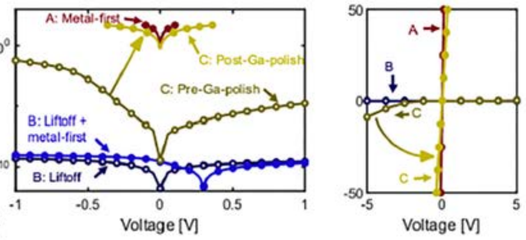

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Figure 1, left: Metal-first process on as-grown heavily n+ doped MOCVD β-Ga_2O_3 results in nearly linear ohmic current-voltage characteristics. TLM measurements give a contact resistance of 0.23 Ω-mm. Figure 2, right: Sample IV curves for contacts processed on both as-grown samples & samples previously processed with liftoff contacts. Data obtained from the liftoff process is indicated with open symbols, while the metal-first process is indicated with filled symbols. Sample A was processed as-grown with the metal-first process. While both sample B & C were processed as-grown with liftoff then re-processed using a metal-first process, only sample C received Ga-flux polishing.

Integration of Quantum Emitters in Silicon Carbide with Nanophotonic Structures

Authors: Jae-Pil So, Jialun Luo, Jaehong Choi, Brendan McCullian, and Gregory D. Fuchs

CNF Project #: 212612

CNF Project PI: Gregory D. Fuchs

Department and Institution: Applied and Engineering Physics, Cornell University

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Primary CNF Tools: Oxford COBRA, Oxford 81 Etcher, 5X g-line stepper, Dicing saw – Disco, SC4500 Odd hour Evaporator, AJA Sputter, Zeiss Supra SEM, Zeiss Ultra SEM, Nabity

Abstract:

Optically accessible spin states in solids are a promising basis for establishing a quantum information platform. Silicon carbide (SiC) offers unique potential for on-chip quantum photonic platforms, as it hosts a variety of optically accessible defects. Especially, V_{Si} in SiC have shown that excellent optical coherence at cryogenic temperatures with millisecond spin-coherence time, and coherent coupling to nuclear spins. However, its out-of-plane orientation of optical dipole disables not only to being excited by free-space pump laser which has in-plane electric field oscillation but also to facilitate integration into nanophotonic structures. In addition, to claim system scalability, the interaction between V_{Si} and photons have not yet been improved. For example, the associated low light collection efficiency result in low signal-to-noise ratio, reduced single-shot readout fidelity and quantum protocol complexity.

In this work, we demonstrate that integration of optically coherent V_{Si} into a plasmonic photonic resonator. This system enables to excite the optical dipole along with the transverse magnetic-like (TM-like) plasmonic whispery gallery (WG) modes. To demonstrate a plasmonic WG mode coupled V_{Si}, we performed optical simulations to optimize the structural parameters, and then fabricated the resonator composed of SiC nanodisk structure encapsulated by a silver layer (Fig. 1a). To access initially the characteristics of the nanopan combined V_{Si}, we optically pumped the nanopan region using a 785 nm continuous-wave laser and compared the emission spectrum to that from the flat surface at 10 K. By comparing the emission spectrum from different regions, we observed the emission rate was significantly enhanced by a factor of 10. In addition, the decay rate of on-resonant emission is enhanced by a factor of 2.39, which convincingly support the origin of the PL enhancement coming from Purcell effect (Fig. 1b). Lastly, we estimated the cooperativity and potential coupling strength via PL excitation measurements to get a better understanding of quantum electrodynamics for this emitter-cavity integrated system. This work will pave the way to exciting applications including the generation of on-chip quantum light sources and studies of cavity-induced coherent interactions between an optical cavity and emitters.

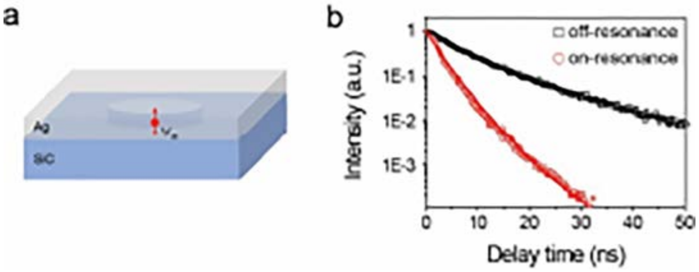
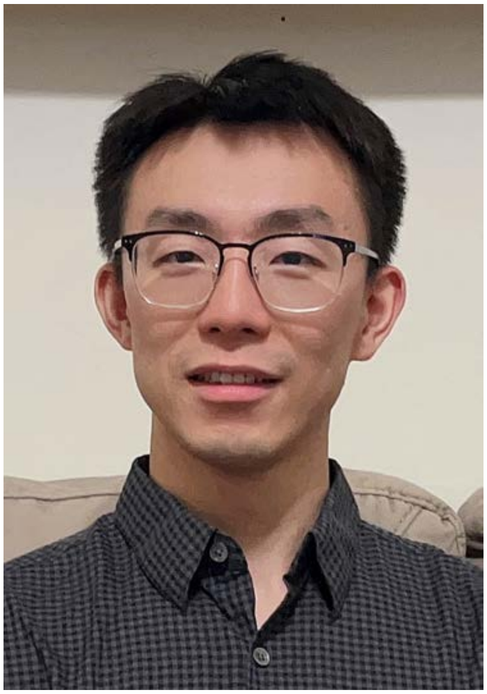


Figure 1: (a) Schematic diagram of the SiC nanodisk/Ag nanopan structure embedding Si vacancy. (b) Time-resolved PL measurements from different emitters (black: off-resonant emitter, red: on-resonant emitter).

Integer and Fractional Chern Insulators in Twisted Bilayer MoTe$_2$



Author(s): Yihang Zeng, Z. Xia, Kin Fai Mak, Jie Shan

CNF Project #: 2633-18

CNF Project PI: Jie Shan

Department and Institution: Department of Physics, Cornell

Contact: yz425@cornell.edu

Primary CNF Tools Used: Zeiss Supra SEM, OXford81 RIE etcher, E beam evaporator, Heidelberg mask writer, AFM Veeco Icon

Abstract:

Chern insulators, which are the lattice analogs of the quantum Hall states, can potentially manifest high-temperature topological orders at zero magnetic field to enable next-generation topological quantum devices. To date, integer Chern insulators have been experimentally demonstrated in several systems at zero magnetic field, but fractional Chern insulators have been reported only in graphene-based systems under a finite magnetic field. The emergence of semiconductor moiré materials, which support tunable topological flat bands, opens a new opportunity to realize fractional Chern insulators. In this talk, I will present evidence for both integer and fractional Chern insulators at zero magnetic field in small-angle twisted bilayer MoTe$_2$. Combining our newly developed local electronic compressibility measurement and magneto-optical measurement, we find the system is incompressible and spontaneously breaks time reversal symmetry at hole filling factor 1 and 2/3. We show that they are integer and fractional Chern insulators, respectively, from their dispersion in filling factor with applied magnetic field. I will further demonstrate electric-field-tuned topological phase transitions involving the Chern insulators. Our findings pave the way for demonstration of quantized fractional Hall conductance and anyonic excitation and braiding in semiconductor moiré materials.

Chemically Driven Palladium Based Actuators

Author(s): Hanyu Alice Zhang[1], David A. Muller[1,2], Itai Cohen[2,3], Paul L. McEuen[2,3], and Nicholas L. Abbott[4]

CNF Project #: 273618

CNF Project PI: Nicholas Lawrence Abbott

Department and Institution: 1 School of Applied and Engineering Physics; 2 Kavli Institute at Cornell for Nanoscale Science; 3 Laboratory of Atomic and Solid-State Physics; 4 Smith School of Chemical and Biomolecular Engineering: Cornell University

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Primary CNF Tools Used: AJA sputter, Oxford PECVD, ABM Contact Aligner, OEM Endeavor AlN sputtering system, PT770 Etcher, DISCO Dicing Saw, Leica Critical Point Dryer

Abstract:

Prior studies have demonstrated rapid and reversible actuation of platinum-based bimorph structures driven by gaseous reactants (H_2 and Ov) [1] and applied voltages in solution [2, 3]. Whereas actuation of platinum is driven by surface stresses associated with surface-adsorbed species, palladium appears a promising alternative with potential to lead to stronger actuation forces than platinum due to its known ability to absorb hydrogen and undergo hydrogen-triggered phase transitions. In this talk, I will describe prior studies of platinum actuators, and contrast their performance to new results obtained with palladium actuators driven by gaseous hydrogen. Additionally, I will discuss our understanding of the material science and chemistry behind driving palladium-based actuators in gaseous environments.

References:

[1] Nanqi Bao, et al. Gas-phase microactuation using kinetically controlled surface states of ultrathin catalytic sheets PNAS 120 (19) e2221740120 (2023)

[2] Marc Z. Miskin, et al. Electronically integrated, mass-manufactured, microscopic robots Nature 584, 557–561 (2020)

[3] Qingkun Liu, et al. Micrometer-sized electrically programmable shape-memory actuators for low-power microrobotics Science Robotics Vol 6, Issue 52 (2021)

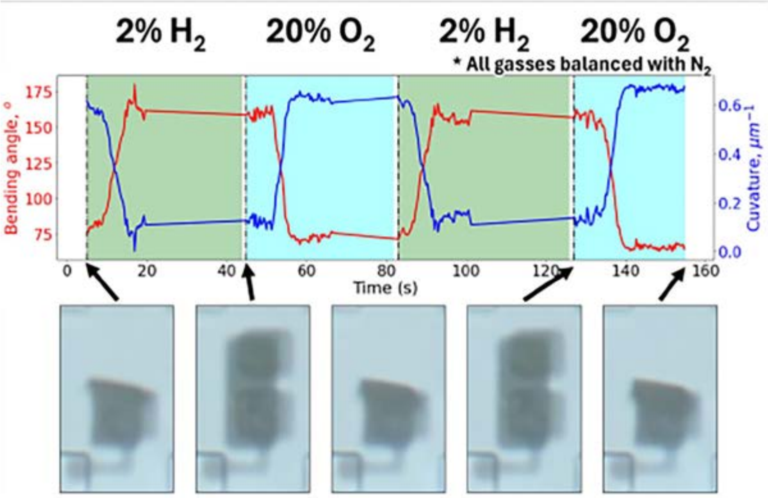

Figure 1: Palladium-based hinge responding to hydrogen and oxygen.

Prof. Huili Grace Xing

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Insulator or Semiconductor? Lessons Learned from Wide Bandgap Semiconductors

Abstract

A material with a bandgap higher than 2 eV were often categorized as an insulator. The relentless pursuit of light-emitting diodes (LEDs) in the past seven decades, especially the high-efficiency visible LEDs, leads to development of the extremely pure semiconductor with a bandgap ranging from 2 eV to 6 eV to date. To fully unleash the potential of a semiconductor, it is critical to 1) control its defect levels below the limits that the targeted applications can tolerate, 2) control its doping in both n-type and p-type, and 3) engineer the most effective carrier injection into the conduction and valence bands, i.e. excellent ohmic contacts. A DUV emitter is an epitome of devices where these requirements need to be met. Even for an application that can be successful in engineering only one band of the semiconductor, availability of adequate control of the other band expands the design and operation space of the device tremendously. I will discuss advances in fundamental science and technology development in wide bandgap semiconductors.

Biography:

Huili Grace Xing is currently the William L. Quackenbush Professor of Electrical and Computer Engineering, Materials Science and Engineering at Cornell University, the Director of SUPREME - a SRC JUMP2.0 research center, and having recently served as the Associate Dean for Research & Graduate Studies of the College of Engineering.

She is a recipient of the AFOSR Young Investigator Award, NSF CAREER Award, ISCS Young Scientist Award, and the Intel Outstanding Researcher Award. She is a fellow of APS, IEEE & AAAS.

Grace received B.S. in physics from Peking University (1996), M.S. in Material Science from Lehigh University (1998) and Ph.D. in Electrical Engineering from University of California, Santa Barbara (2003), respectively. She was a faculty with the University of Notre Dame from 2004 to 2014. Her research focuses on development of III-V nitrides, 2-D crystals, oxide semiconductors, recently multiferroics & magnetic materials: growth, electronic and optoelectronic devices, especially the interplay between material properties and device development for high performance devices, including RF/THz devices, tunnel field effect transistors, power electronics, DUV emitters and memories. Together with her colleague Debdeep Jena, they were the first to demonstrate distributed polarization doping (DPD), especially the p-type DPD. This doping scheme is fundamentally different from impurity doping and modulation doping, thus dubbed as the 3rd generation of doping science by Xing. Polarization doping is particularly powerful in polar ultrawide bandgap semiconductors since it might be the only known method to achieve both n-type and p-type in an UWBG semiconductor with doping properties akin to shallow impurity dopants.

She has delivered 200+ invited talks and seminars, and has authored/co-authored 300+ journal papers including Nature journals, Physical Review Letters, Applied Physics Letters, Electron Device Letters, and 120+ conference proceeding publications in IEDM, ISPSD etc. Her h-index is 78 on google scholar.

Precise Control of Surface-Tethered Polypeptide Nanostructures via Nanolithography, Solvent-Assisted Treatments and End-Point Functionalization

Author(s): Yuming (Robin) Huang, Luis A. Padilla, Warren R. Zipfel, Su-Mi Hur, Christopher K. Ober

CNF Project #: 1757-09

CNF Project PI: Christopher K. Ober

Department and Institution: Materials Science and Engineering, Cornell

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Primary CNF Tools: JEOL 9500, Oxford 81, Zeiss SEM, Veecon Icon AFM

Abstract

While nanostructures offer distinct advantages in terms of unique properties and enhanced performance relative to their bulk equivalents, they often suffer from limitations such as low stability and high toxicity. Transitioning to surface-tethered systems using biomaterials such as self-assembling polypeptides to form nanostructured brushes can be one solution to these challenges. However, the precise control and characterization of the molecular organizations within these brushes have always been non-trivial.

This study aims to fill these gaps by fabricating polypeptide-based nanostructured systems via an integrated process of nanolithography, surface-initiated vapor-phase reactions, solvent-assisted treatment (SAT), and end-point functionalization to facilitate the understanding of inter-chain organization using a fluorescence-guided and simulated-assisted approach. Moreover, a vapor annealing system with in-situ monitoring capability is developed to assess the tunability and vapor-responsiveness of the resulting nanostructures. As a result, "Nanospikes" of polymer brushes with sub-50nm features were produced. The topology and areal behavior of the resulting patterned rod-like brushes were analyzed and compared with patterned coil-type brushes. A geometric study of these self-assembled "nanospikes" was carried out, and their cross sections were investigated via focused ion beam (FIB) and scanning electron microscopy (SEM). Moreover, the fluorescence-guided analysis of solvent-treated nanostructures revealed strong correlations between film properties such as roughness, thickness, and refractive index, end-point behaviors such as aggregation, immobilization and orientation, and chain orientation such as average tilt angle, enabling the extrapolation of the overall molecular arrangement with the assistance of computational simulations.

In conclusion, this work paves the way for the development of highly modular and tunable nano-systems with excellent stability by developing an integrated approach to fabricate highly tunable, surface-tethered polypeptide nanostructures, setting the stage for future advancements in bio-inspired technologies, nanoactuators, localized/miniaturized devices and surface-based sensing platforms.

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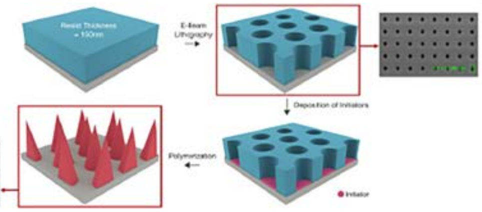

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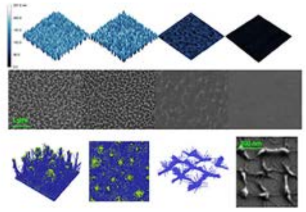

Figure 1, left: Formation of polypeptide "nanospikes" via electron-beam lithography. Figure 2, right: Precise control of inter-chain organization via SAT and computational modeling.

Solderable Multisided Metal Patterns Enables 3D Integrable Direct Laser Written Polymer MEMS

Author(s): Landon Ivy, Amit Lal

CNF Project #: 1262-04

CNF Project PI: Amit Lal

Department and Institution: ECE, Cornell.

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Primary CNF Tools Used: Nanoscribe GT2, Glenn 1000, Even hour evaporator

Abstract:

Advancing highly integrated micro sensors and actuators calls for the ability to scale down three-dimensional structures while ensuring efficient electrical interconnectivity. This necessitates addressing a pressing need to develop novel techniques for shrinking components and facilitating seamless interconnectivity to the miniature structures. This talk will focus on a novel three-step fabrication method to produce 3D prints fabricated by direct laser writing (DLW) via two-photon polymerization (TPP), with multisided evaporated metal patterns. The three steps consist of printing the core structure and shadow mask shell (SMS) on sacrificial Dextran 70, evaporating metal onto the desired side(s), and then releasing the core and SMS in water. To showcase this process' capabilities, we produced a simple characterization structure featuring two electrical vias, an out-of-plane serpentine resistor, and four solderable electrodes. With this test structure, three firsts were achieved for the TPP community: (1) The deposition of metal patterns onto opposing sides of a DLW structure; (2) the flip-chip soldering of said structure to a PCB; and (3) the verification of electrical continuity through its two microvias.

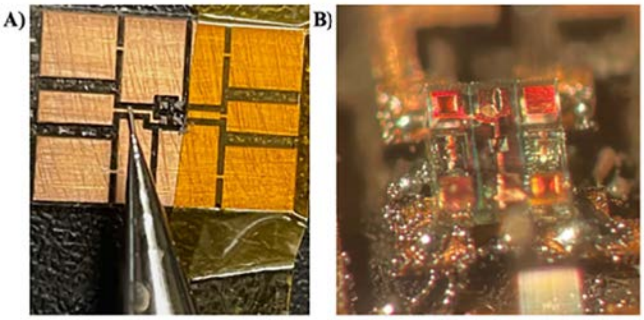


Fig. 3. Soldering steps: (A) Low temperature solder paste ejected onto FR4 PCB with laser-patterned copper pads. (B) Metallized DLW print soldered to PCB using flip chip bonder; note the punched-out hole left in the center electrode after attempting to wirebond to it, i.e., underlying polymer is too soft.

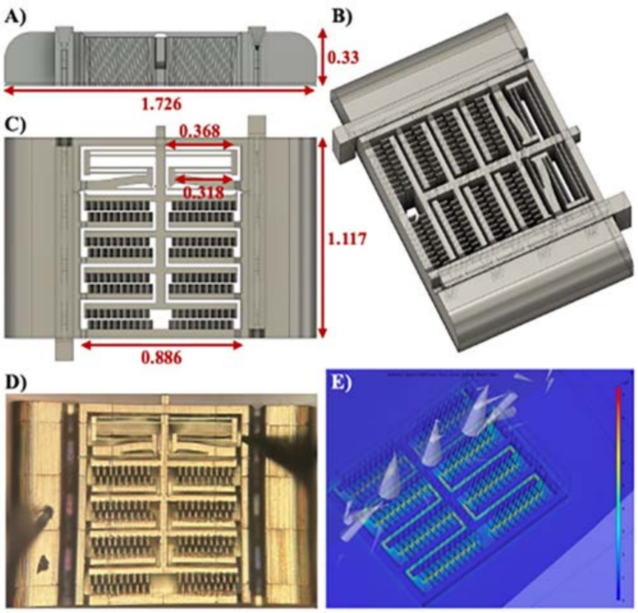


Fig. 6. CD: (A) Front, (B) isometric, and (C) top views of model. Finger/spring widths and finger gaps are 8 µm and 10 µm, resp. Measured 0.601 pF (D)

Tailoring the Optical and Electrical Properties of MoTe$_2$ via Electrochemical Intercalation of Lithium Ions

Authors: Alyssa Shiyu Xu, K. Evans-Lutterodt, M. Wang, S. Li, J. Huang, N. Williams, P. Guo, A. Singer, J.J. Cha

CNF Project #: 303522

CNF Project PI: Judy Cha

Department and Institution: MSE, Cornell University

Contact: sx269@cornell.edu

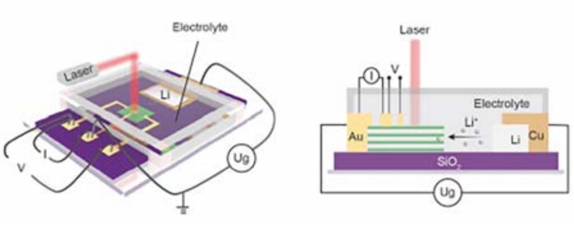
Primary CNF Tools: Heidelberg Mask Writer , SC4500 Odd-Hour Evap

Abstract:

Intercalation of lithium (Li) ions is one of the most effective methods to realize structural transformation and to tune the optical and electrical properties of two-dimensional transition metal dichalcogenides (2D TMDCs). Numerous studies have focused on the phase transition from semiconducting 2H phase to metallic 1T (or 1T') phase in MoS$_2$ and WS$_2$ induced by the intercalation of Li ions. However, few reports explore the effects of Li intercalation in other TMDCs, such as Mo- or W- ditellurides. In particular, novel electronic and energy devices can be achieved using the Li-intercalated MoTe$_2$ with its intriguing electrical, topological and catalytic properties.

Here, we report electrochemical Li intercalation into 1T'- MoTe$_2$ flakes. The 1T' phase is stable down to 0.9 V of the applied electrochemical voltage, and two new phases are observed at 0.7 V (phase I) and 0.4 V (phase II), respectively. The lightly Li-intercalated phase I is evidenced by the disappearance of the A$_g$ peak at ~77.7 cm^{-1} and the appearance of a peak at ~86.9 cm^{-1} in Raman spectroscopy and a 10% increase of electrical resistance in two-terminal measurements. For the heavily Li-intercalated phase II, we observe a lattice expansion of ~7% in (001) direction in single-crystal X-ray diffraction, the emergence of new Raman peaks at 16.8 cm^{-1}, 109.0 cm^{-1} and 132.8 cm^{-1} in Raman spectroscopy and increase of electrical resistance for over 8 folds. *In situ* Hall effect measurements confirm the decrease in conductivity, which also decreases with decreasing temperature for the phase II, suggesting a semiconducting phase. The Hall carrier density falls from 10^{15} cm^{-2} in pristine 1T'-MoTe$_2$ to 10^{14} cm^{-2} in phase I and to 10^{12} cm^{-2} in phase II.

Our results highlight the importance of electrochemical intercalation of Li ions as a powerful tool to manipulate phase stability and electron density of 2D TMDCs.



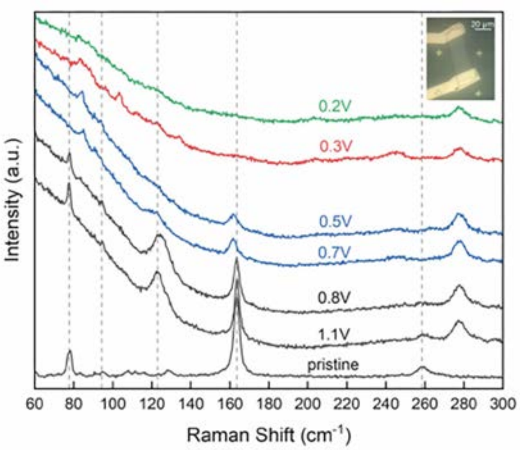


Figure 1, top: Schematic of a lithium-ion electrochemical cell with capabilities of in situ Raman and in situ Hall measurements. Figure 2, Bottom: In-situ Raman spectra of a 1T'-MoTe$_2$ nanoflake as a function of intercalation voltage. The black, blue, red, and green lines represent T' phase, lightly Li-intercalated phase I, heavily Li-intercalated phase II and amorphous state, respectively. Inset: an optical image of the 1T'-MoTe$_2$ nanoflake; scale bar, 20 µm.

POSTER SUMMARIES

POSTER 1 ZHAO

Temperature Dependent Properties of Ku-Band Epitaxial AlN FBARs

Authors: Wenwen Zhao, Rishabh Singh, Jimy Encomendero, Kazuki Nomoto, Lei Li, James C. M. Hwang, Huili Grace Xing, and Debdeep Jena

CNF Project Number: 280119

CNF Principal Investigator: Debdeep Jena, Huili Xing

Department and Institution: Applied and Engineering Physics, Cornell University

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POSTER 2 ZHANG (Z)

Synthesis of Fluorinated Polystyrene-block-poly(vinyl methyl siloxane) for Improved Coating Anti-penetration Performance

Authors: Zhenglin Zhang, Krishnaroop Chaudhuri, Florian Kaefer, Anthony P. Malanoski, Kirt A. Page, Louisa M. Smieska, Jonathan T. Pham, Christopher K. Ober

CNF Project Number: 275118

CNF Principal Investigator(s): Christopher K. Ober

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POSTER 3 ZHANG (H)

Chemically Driven Palladium Based Actuators

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CNF Project #: 273618

CNF Project PI: Nicholas Lawrence Abbott

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POSTER 4 ZENG

Integer and Fractional Chern Insulators in Twisted Bilayer MoTe2

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CNF Project #: 2633-18

CNF Project PI: Jie Shan

Department and Institution: Department of physics, Cornell University

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POSTER 5 YUAN

Controlled Synthesis of Metal-Organic Hybrid Polypeptoids as High-Performance Photoresists for Advanced Lithography

Authors: Chenyun Yuan, Cameron Adams, Rachel A. Segalman, Christopher K. Ober (The middle two authors are our collaborators at UC Santa Barbara)

CNF Project Number: 273318

CNF Principal Investigator(s): Christopher Ober

Affiliation(s): Department of Materials Science and Engineering, Cornell University, Ithaca, NY, United States

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Website: https://ober.mse.cornell.edu

POSTER 6 YU

Patternable Mesoporous Thin Film Superconductors via Block Copolymer Self-Assembly: An Emergent Technology toward Quantum Metamaterials?

Authors: Fei Yu, Paxton Thedford, Ulrich Wiesner

CNF Project Number: 135605

CNF Principal Investigator(s): Ulrich Wiesner

Affiliation(s): Department of Materials Science and Engineering

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Website: wiesner.mse.cornell.edu

POSTER 7 XU & PAL

Strong Photon-Magnon Coupling Using a Lithographically Defined Organic Ferrimagnet

Authors: Qin Xu, Srishti Pal, Hil Fung Harry Cheung, Donley S. Cormode, Tharnier O. Puel, Huma Yusuf, Iqbal B. Utama, Dmitry Lebedev, Michael Chilcote, Mark C. Hersam, Michael E. Flatté, Ezekiel Johnston-Halperin, and Gregory D. Fuchs

CNF Project Number: 212612

CNF Principal Investigator(s): Greg Fuchs

Affiliation(s): School of Applied & Engineering Physics, Cornell University; Dept. of Physics, Cornell University; Dept. of Physics, Ohio State University; Dept. of Physics, University of Iowa; Dept. of Physics, Northwestern University

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POSTER 8 XU

Tailoring the Optical and Electrical Properties of MoTe2 via Electrochemical Intercalation of Lithium Ions

Authors: Alyssa Shiyu Xu, Kenneth Evans-Lutterodt, Mengjing Wang, Shunran Li, Jason Huang, Natalie Williams, Peijun Guo, Andrej Singer, Judy J. Cha*

CNF Project #: 303522

CNF Project PI: Judy Cha

Department and Institution: Materials Science and Engineering Cornell University

Contact: sx269@cornell.edu

POSTER 9 WILLIAMS

Tuning CDW States in Lanthanum Tri-Telluride by Lithium Intercalation

Authors: Natalie L. Williams, Alyssa Shiyu Xu, Saif Siddique, Ratnadwip Singha, Leslie M. Schoop, Judy J. Cha

CNF Project Number: 303522

CNF Principal Investigator(s): Judy J. Cha

Affiliation(s): Department of Material Science & Engineering, Cornell University

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POSTER 10 VANDERBURGH

Scalable Continuous-Flow Electroporation Platform Enabling T Cell Transfection for Cellular Therapy Manufacturing

Authors: Jacob VanderBurgh, Thomas Corso, Stephen Levy, Harold Craighead

CNF Project Number: 290020

CNF Principal Investigator(s): Thomas Corso

Affiliation(s): CyteQuest

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Research Group Website: www.cytequest.com

POSTER 11 VAN WIJNGAARDEN

Mechanical and Ionic Properties of Extracellular Polymeric Substances

Authors: Ellen van Wijngaarden, David Hershey, Ilana Brito, Meredith Silberstein

CNF Project Number: 305823

CNF Principal Investigator(s): Meredith Silberstein

Affiliation(s): Mechanical and Aerospace Engineering, Cornell University

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Websites: https://silbersteinlab.com/, https://www.britolab.org/

POSTER 12 VAN DEURZEN

Dualtronics: Expanding the Functionality of Polar Substrates

Authors: Len van Deurzen, Eungkyun Kim, Henryk Turski, Zexuan Zhang, Anna Feduniewicz-Zmuda, Mikolaj Chlipala, Marcin Siekacz, Huili Grace Xing, and Debdeep Jena

CNF Project Number: IRG Nitride Photonics

CNF Principal Investigator(s): Professor Debdeep Jena

Affiliation(s): School of Applied and Engineering Physics, Cornell University, Ithaca, NY 14853, USA; School of Electrical and Computer Engineering, Cornell University, Ithaca, NY 14853, USA; Institute of High-Pressure Physics, Polish Academy of Sciences, 01-142 Warsaw, Poland; Department of Material Science and Engineering, Cornell University, Ithaca, NY 14853, USA; Kavli Institute at Cornell for Nanoscale Science, Cornell University, Ithaca, New York 14853, USA

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Research Group Website: https://jena-xing.engineering.cornell.edu/

POSTER 13 SUH

Development of a 3D Microfluidic Platform for Dynamic Compression of Tumor Spheroids

Authors: Young Joon Suh, Mrinal Pandey, Tao Luo, and Mingming Wu

CNF Project Number: 206811

CNF Principal Investigator(s): Mingming Wu

Affiliation(s): Department of Biological and Environmental Engineering, Cornell University

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POSTER 14 SO

Integration of Quantum Emitters in SiC with Nanophotonic Structures

Authors: Jae-Pil So, Jialun Luo, Jaehong Choi, Brendan McCullian, and Gregory D. Fuchs

CNF Project #: 212612

CNF Project PI: Gregory D. Fuchs

Department and Institution: Applied and Engineering Physics, Cornell University

Contact: js3338@cornell.edu

POSTER 15 SMITH

Non-Alloyed Low Resistance Contacts to (010) ?-Ga2O3 Enabled by Ga-Flux Polishing

Author(s): Kathleen Smith, Cameron Gorsak, Avijit Kalra, Kathy Azizie, Darrell Schlom, Debdeep Jena, Hair Nair, Huili Grace Xing

CNF Project #: 280219

CNF Project PI: Huili Grace Xing

Department and Institution: School of Applied and Engineering Physics, Cornell University

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POSTER 16 SKVARLA (STAFF)

Miscellaneous Capabilities

Authors / Staff: Chris Alpha, Mike Skvarla

Affiliation: Cornell NanoScale Facility, Cornell University

Contact: cga44@cornell.edu , mjs47@cornell.edu

CNF Tool Set or Area or Capability Presented: Thermal Processing, CMP, Lift-off, other tools

Summary of Poster: We show a collection of ancillary tools needed for many projects in the CNF

POSTER 17 SEMPERTEGUI

Collagen Mineralization and Breast Cancer-Derived Factors Synergistically Regulate Mesenchymal Stem Cell Behavior

Authors: Nicole Sempertegui, Stephanie Lux, Matthew Whitman, Siyoung Choi and Claudia Fischbach

CNF Project Number: 2912-20

CNF Principal Investigator(s): Claudia Fischbach

Affiliation(s): Biomedical Engineering, Cornell University

Contact: nds68@cornell.edu

Research Group Website: https://fischbachlab.bme.cornell.edu

POSTER 18 SARTORELLO (STAFF)

Nanoscribe GT@ 3D Lithography System Updates & Improvements

Authors / Staff: Giovanni Sartorello, Samantha Averitt, Roberto Panepucci

Affiliation: Cornell NanoScale Facility, Cornell University; University of California, C Berkeley

Contact: gs664@cornell.edu, saveritt@berkeley.edu, rrp23@cornell.edu

CNF Tool Set or Area or Capability Presented: Nanoscribe GT2/direct write lithography

Summary of Poster: We explore the resolution limits of the Nanoscribe GT2 on standard photolithographic resists, and alignment to preexisting markers with one micrometer accuracy.

POSTER 19 SAM

Nanomolding of Topological Semimetals for Next-Generation Interconnects

Authors: Q.P. Sam, Y. Cheon, M.T. Kiani, N.K. Duong, J.J. Cha

CNF Project Number: 303222

CNF Principal Investigator(s): Judy J. Cha

Affiliation(s): Department of Materials Science and Engineering, Cornell University (Q.P. Sam, M.T. Kiani, J.J. Cha)

Department of Physics, Cornell University (Y. Cheon, N.K. Duong)

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POSTER 20 PERSSON

Collagen Mineralization Inhibits the Capacity of Macrophages to Stimulate Breast Cancer Cell Invasion

Authors: Kylie Persson, Matthew Tan, Siyoung Choi, Lara Estroff, Claudia Fischbach

CNF Project Number: 2912-20

CNF Principal Investigator(s): Claudia Fischbach

Affiliation(s): Biomedical Engineering, Cornell University

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Research Group Website: https://fischbachlab.bme.cornell.edu

POSTER 21 PANEPUCCI (STAFF)

PhotoLithography/Nanoimprint

Authors / Staff: Roberto Panepucci, Xinwei Wu, John C. Treichler

Affiliation: Cornell NanoScale Facility, Cornell University

Contact: wu@cnf.cornell.edu treichler@cnf.cornell.edu panepucci@cnf.cornell.edu

CNF Tool Set or Area or Capability Presented: PhotoLithography/Nanoimprint

Summary of Poster: Update on CNF's Nanoimprint system, the Nanonex NX2500. Nanoimprint copies of silicon or quartz stamps made by electron beam lithography enable fast and simple replication of sub-100nm pattern transfers suitable for metamaterials and other nanoscale research.

POSTER 22 NARANJO (2023 CNF REU INTERN)

Wafer-Scale Fabrication of Single Domain Magnetic Nanostructures

2023 CNF REU Intern: Naomi Sharlotte Naranjo

2023 CNF REU Intern Affiliation: Mechanical Engineering, Cornell University

2023 CNF REU Principal Investigator: Professor Itai Cohen, Physics Department, Cornell University

2023 CNF REU Mentor(s): Melody Lim, Zexi Liang; Physics Department, Cornell University

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POSTER 23 MUSA (STAFF)

Computing and CAD at CNF

Author(s): Dave Botsch, Karlis Musa

Affiliation(s) Cornell NanoScale Science and Technology Facility

Contact: computing@cnf.cornell.edu

Primary CNF Tools Used / Included: Linux HotDesking w CNF Thin, Linux conversion servers Korat and Minx, Simulation Software, CAD Software, Image/Data Analysis Software, CAD Rm Computing Lab, Windows CAD Workstations, Virtual CAD Room Remote Windows Desktops, Large format poster printer, Remote video tool trainings, Pseudopotential Vault, OpenAFS file system, 3D CAD Computing Server, AWS Conversion Cloud, Computation/Simulation Cluster

POSTER 24 MILLER-MURTHY

Thermal Performance of Aluminum Nitride-Buffer High Electron Mobility Transistors

Authors: Shankar Miller-Murthy, Austin Hickman

CNF Project Number: 297521

CNF Principal Investigator(s): Austin Hickman

Affiliation(s): Soctera Inc., Praxis Center

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Research Group Website: https://www.soctera.com/

POSTER 25 MEDIN

Using Microfluidic Directed Evolution to Improve Rare Earth Separations with V. Natriegens

Authors: Medin, Sean; Barstow, Buz; Wu, Mingming

CNF Project Number: 285219

CNF Principal Investigator(s): Buz Barstow, Mingming Wu

Affiliation(s): Department of Biological and Environmental Engineering, Cornell University

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POSTER 26 LUO

Room Temperature Optically Detected Magnetic Field Resonance in Single Spins in GaN

Authors: Jialun Luo, Yifei Geng, Farhan Rana, Gregory D. Fuchs

CNF Project Number: 212612

CNF Principal Investigator(s): Gregory D. Fuchs, Farhan Rana

Affiliation(s): Department of Physics (Jialun), School of Electrical and Computer Engineering (Yifei, Farhan), School of Applied and Engineering Physics (Greg); Cornell University

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Research Group Website: https://fuchs.research.engineering.cornell.edu

POSTER 27 LIM

Programmable Nanomagnets for Microscopic Self-Assembly

Authors: Melody Xuan Lim, Zexi Liang, Conrad Smart, Itai Cohen, Paul L. McEuen

CNF Project Number: 296421

CNF Project PIs: Itai Cohen, Paul L. McEuen

Department and Institution: Kavli Institute at Cornell for Nanoscale Science, School of Applied and Engineering Physics, Laboratory of Atomic and Solid-State Physics, Department of Physics, Cornell University

Contact email: mxl3@cornell.edu

POSTER 28 LI (T)

Extraordinary Permittivity Characterization of 4H SiC at Millimeter-Wave Frequencies

Authors: Tianze Li, Lei Li, Jin Hong Joo, Xiaopeng Wang, and James C. M. Hwang

CNF Project Number: 307823

CNF Principal Investigator(s): James C. M. Hwang

Affiliation(s): Material Science & Engineering, Cornell University

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POSTER 29 LI (L)

A D-band Frequency-Doubling Distributed Amplifier Through Monolithic Integration of SiC SIW and GaN HEMTs

Authors: Lei Li

CNF Project Number: 305923

Principal Investigator(s): James C M Hwang

Affiliation(s): ECE, Cornell

Contact: ll886@cornell.edu

POSTER 30 KUAN

Diamond MEMS for Quantum Control and Sensing

Authors: Johnathan Kuan, Gregory Fuchs

CNF Project Number: 2126-12

CNF Principal Investigator(s): Gregory Fuchs

Affiliation(s): Physics, Cornell University

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Research Group Website: https://fuchs.research.engineering.cornell.edu

POSTER 31 KIM

N-polar GaN/AlGaN/AlN High Electron Mobility Transistors on Single-Crystal Bulk AlN Substrates

Authors: Eungkyun (EK) Kim, Zexuan Zhang, Jashan Singhal, Yushin Chen, Naomi Pieczulewski, David Muller, Debdeep Jena, Huili Grace Xing

CNF Project Number: 280019

CNF Principal Investigator(s): Grace Xing

Affiliation(s): School of Electrical and Computer Engineering, Cornell University

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Research Group Website: https://jena-xing.engineering.cornell.edu/

POSTER 32 IVY

Solderable Multisided Metal Patterns Enables 3D Integrable Direct Laser Written Polymer MEMS.

Author(s): Landon Ivy, Amit Lal

CNF Project #: 1262-04

CNF Project PI: Amit Lal

Department and Institution: ECE, Cornell.

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POSTER 33 INFANTE (STAFF)

Furnace Processing, Capabilities and Specifications

Authors / Staff: Phil Infante

Affiliation: Cornell NanoScale Facility, Cornell University

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CNF Tool Set or Area or Capability Presented: Furnaces

Summary of Poster: This poster outlines CNF furnace process and capabilities.

POSTER 34 HUANG

Precise Control of Surface-Tethered Polypeptide Nanostructures via Nanolithography, Solvent-Assisted Treatments and End-Point Functionalization

Author(s): Yuming (Robin) Huang, Luis A. Padilla, Warren R. Zipfel, Su-Mi Hur, Christopher K. Ober

CNF Project #: 1757-09

CNF Project PI: Christopher K. Ober

Department and Institution: Materials Science and Engineering, Cornell University

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POSTER 35 GUO

Developing a Single Spin Microscope for Nanoscale Magnetic Imaging

Authors: Qiaochu Guo, Anthony D'Addario, Yang Cheng, Lucas Caretta, Piush Behera, Antonio B. Mei, Jeremy Kline, Isaiah Gray, Hil Fung Harry Cheung, Darrell G. Schlom, Ramamoorthy Ramesh, Fengyuan Yang, Katja Nowack, Gregory D. Fuchs

CNF Project Number: 212612

CNF Principal Investigator(s): Greg Fuchs

Affiliation(s): School of Applied and Engineering Physics

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Research Group Website: https://fuchs.research.engineering.cornell.edu/

POSTER 36 FAVAKEH

Broadband Electrical Impedance Spectroscopy of a Single Cell

Authors: Amirhossein Favakeh, Amir Mokhtare, Alireza Abbaspourrad

CNF Project Number: 282719

CNF Principal Investigator: Alireza Abbaspourrad

Affiliation(s): Department of Food Science, College of Agriculture and Life Sciences, Cornell University

Contact: af446@cornell.edu, am2964@cornell.edu, alireza@cornell.edu

Primary CNF Tools Used: ABM Contact Aligner, Heidelberg Mask Writer - DWL2000, SC4500 Even-Hour Evaporator, Oxford etchers

POSTER 37 DILL

First GaN/AlN p-channel FinHFETs on Single-Crystal AlN Substrates

Authors: Joseph Dill (2), Zexuan Zhang (1), Kazuki Nomoto (1), Jimy Encomendero (1), Lei Li (1), Reet Chaudhuri (1), Austin Hickman (1), Naomi Pieczulewski (3), Masato Toita (4), Jim. C. M. Hwang (1), David A. Muller (2), Debdeep Jena (1,3,5), Huili Grace Xing (1,3,5)

CNF Project Number: 280019

CNF Principal Investigator(s): Huili Grace Xing

Affiliation(s): 1 School of Electrical and Computer Engineering, Cornell University, Ithaca, NY 14853, USA; 2 Department of Applied & Engineering Physics, Cornell University, Ithaca, NY 14853, USA; 3 Department of Material Science and Engineering, Cornell University, Ithaca, NY 14853, USA; 4 Kavli Institute at Cornell for Nanoscale Science, Cornell University, Ithaca, NY 14853, USA; 5 Advanced Devices Technology Center, Asahi Kasei Corporation, Hibiya Mitsui Tower, 1-1-2 Yurakucho, Chiyoda-ku, Tokyo 100-8440, Japan

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Research Group Website: https://jena-xing.engineering.cornell.edu/

POSTER 38 D'CRUZ

Additive Manufacturing and Characterization of Porous Ceramic Electrospray Emitters

Authors: Luke D'Cruz, Suhail Chamieh

CNF Project Number: 2953-21

CNF Principal Investigator: Sadaf Sobhani

Affiliation: Department of Mechanical and Aerospace Engineering

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Research Group Websites: https://www.sobhanilab.com/,
https://www.astralab.mae.cornell.edu/

POSTER 39 CROWLEY

Exploring the 3D Genome of Breast Cancer in Unprecedented Detail

Authors: Jack Crowley, Thomas Roberts, Eryka Kairo, Mitchell Woodhouse, Claudia Fischbach-Teschl, Warren Zipfel

CNF Project #: 142506

CNF Project PI: Warren Zipfel

Department and Institution: Applied & Engineering Physics, Cornell University

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Website: https://fischbachlab.bme.cornell.edu/

POSTER 40 CROMER (NEXT TO POSTER 15 SMITH)

Gallium Oxide Power Diodes

Author(s): Bennett Cromer, Cameron Gorsak, Wenwen Zhao, Lei Li, Wenshen Li, Kathleen Smith, Katie Gann, Kazuki Nomoto, Nolan Hendriks, Andy Green, Kelson Chabak, Hair Nair, James C. Hwang, Bruce Van Dover, Michael Thompson, Debdeep Jena, Grace Huili Xing

CNF Project #: 280219

CNF Project PI: Grace Xing

Department and Institution: Materials Science and Engineering / Cornell University

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POSTER 41 CLARK (STAFF)

Thin Film Deposition? at the Cornell NanoScale Facility?

Authors / Staff: Jeremy Clark, Tom Pennell, Aaron Windsor

Affiliation: Cornell NanoScale Facility, Cornell University

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CNF Tool Set or Area or Capability Presented: Thin films deposition

Summary of Poster: This poster outlines CNF's PECVD, ALD, Sputtering, and Evaporation capabilities, including recent updates.

POSTER 42 CHAO

Electrical Sensing of SARS-CoV2 Entries Using Supported Lipid Bilayers

Authors: Zhongmou Chao, Ekaterina Selivanovitch, Susan Daniel

CNF Project Number: 168608

CNF Principal Investigator: Susan Daniel

Affiliation(s): Chemical and Biomolecular Engineering, Cornell University

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Research Group Website: https://daniel.cbe.cornell.edu/

POSTER 43 CHAM

Exchange Bias between van der Waals Materials: Tilted Magnetic States and Field-free Spin-orbit-torque Switching.

Author(s): Cham, T.M.J., Dorrian, R.J., Zhang, X.S., Dismukes, A.H., Chica, D.G., May, A.F., Roy, X., Muller, D.A., Ralph, D.C. and Luo, Y.K.

CNF Project #:598-96

CNF Project PI: Dan Ralph

Department and Institution: LASSP Cornell University

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POSTER 44 CESTAROLLO

Controlling Actuation at the Microscale: MEMS-Inspired Device with Magnetic-Field Driven Actuation

Authors: Ludovico Cestarollo, Rodolfo Cantu, Amal El-Ghazaly, Zexi Liang, Melody Lim, Conrad Smart, Karthik Srinivasan

CNF Project Number: 286620

CNF Principal Investigator(s): Amal El-Ghazaly

Affiliation(s): Cornell University - Materials Science and Engineering, Electrical and Computer Engineering

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Research Group Website: https://vesl.ece.cornell.edu/

POSTER 45 BURGETT

Road to Mechanical Detection of Single Electron Spins

Authors: Russell W. Burgett, George R. Du Laney, Peter Sun, Michael C. Boucher, John A. Marohn

CNF Project Number: 212512

CNF Principal Investigator(s): John Marohn

Affiliation(s): Cornell University, Chemistry & Chemical Biology

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POSTER 46 BORDONARO (STAFF)

Photolithography Tool Area Updates

Authors / Staff: Garry Bordonaro, John Treichler, Giovanni Sartorello

Affiliation: Cornell NanoScale Facility, Cornell University

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CNF Tool Set or Area or Capability Presented: Photolithography

Summary of Poster: Recent and upcoming additions and upgrades to the Photolithography tool set.

POSTER 47 BLOOM (2023 CNF REU Intern)

Electrical Interconnects based on Delafossite Thin Films

2023 CNF REU Intern: Paul Bloom

2023 CNF REU Intern Affiliation: Optical Engineering, University of Rochester

2023 CNF REU Principal Investigator: Dr. Hari Nair, Materials Science and Engineering, Cornell University

2023 CNF REU Mentor(s): Bilal Azhar, Materials Science and Engineering, Cornell University

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Website: https://cnf.cornell.edu/education/reu/2023

POSTER 48 BLEIER (STAFF)

Electron Beam Lithography at CNF

Authors / Staff: Alan R. Bleier, John C. Treichler, Roberto Panepucci

Affiliation: Cornell NanoScale Facility, Cornell University

Contact: bleier@cnf.cornell.edu treichler@cnf.cornell.edu panepucci@cnf.cornell.edu

CNF Tool Set or Area or Capability Presented: Electron Beam Lithography

Summary of Poster: Beamer7 from GeniSys is now available and VisualJob is configured as a ´Wizard´ to create Jobs with automatic labels. H-SiQ resist is now stored in liquid nitrogen for indefinite shelf life; and the JEOL9500 has 4 new chucks that allow users to prepare samples for writing on 4”, 6” and pieces while other users are using the tool for those same wafer sizes.

POSTER 49 ALVAREZ

Cross-Plane Thermal Conductivity of h-BN Thin Films Grown by Pulsed Laser Deposition

Author(s): Gustavo A. Alvarez

CNF Project Number: 275819

Principal Investigator(s): Zhiting Tian

Affiliation(s): Sibley School of Mechanical and Aerospace Engineering, Cornell University

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Website: https://ztgroup.org/

POSTER 50 WU (STAFF)

Metrology and Packaging Capabilities

Authors / Staff: Mac McMurdy, Xinwei Wu

Affiliation: Cornell NanoScale Facility, Cornell University

Contact: mcmurdy@cnf.cornell.edu, wu@cnf.cornell.edu

CNF Tool Set or Area or Capability Presented: Metrology

Summary of Poster: This poster shows tools and their capabilities in Optical Metrology, Surface & Composition Metrology and Packaging areas at CNF

POSTER 51 PENNELL (STAFF)

Education and Outreach at CNF

Authors / Staff: Tom Pennell, Ron Olson, Christopher Ober

Affiliation: Cornell NanoScale Facility, Cornell University

Contact: pennell@cnf.cornell.edu

Summary of Poster: A summary of the various education and outreach activities taking place at CNF.

TABLE = PENNELL & MCMURDY (52)

CNF Matterport Virtual Cleanroom Experience

Authors / Staff: Tom Pennell, Mac McMurdy

Affiliation: Cornell NanoScale Facility, Cornell University

Contact: pennell@cnf.cornell.edu

CENTER POSTER TABLE VANEE (53)

The Biotechnology Resource Center

Author(s): James VanEe

Principal Investigator: Matt DeLisa

Affiliation(s): Cornell Institute of Biotechnology

Contact: jiv2@cornell.edu, md255@cornell.edu

Website: www.biotech.cornell.edu

Summary of Poster: The mission of the Cornell Institute of Biotechnology (CIB) is to promote research and catalyze entrepreneurial activities in the life sciences. The CIB serves as the hub of Cornell's biotechnology and life science ecosystem, and helps foster its growth and development by relying on three important pillars: our people, our core facilities, and commercialization expertise.

CENTER POSTER TABLE PORRI (54)

Biotechnology Resource Center Imaging Facility and Cornell Visualization and Imaging Partnership

Authors: TJ Porri, Rebecca Williams, Johanna Dela Cruz, Tina Abratte

Affiliation(s): Institute of Biotechnology, Cornell University

Contact: tp252@cornell.edu

Website: https://www.biotech.cornell.edu/core-facilities-brc/facilities/imaging-facility

Summary of Poster: Microscopes, CT, ultrasounds and more. Imagine it, we image it!

CENTER POSTER TABLE LUEBKE (55)

Center for Technology Licensing at Cornell

Authors: Ryan Luebke, Maxim Shabrov

Affiliation(s): Center for Technology Licensing

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Website: https://ctl.cornell.edu/

Summary of Poster: The Center for Technology Licensing (CTL) is Cornell University's technology transfer office. CTL's mission is to bring the University's scientific discoveries, technological innovations, and medical advances to the marketplace for societal benefit and to foster new venture creation and growth to support economic development within New York State and across the nation.

CENTER POSTER TABLE DIENEL (56)

PARADIM – Platform for the Accelerated Realization, Analysis, and Discovery of Interface Materials

Authors: Thomas Dienel, Tyrel McQueen, Darrell Schlom

Affiliation(s): Cornell University and Johns Hopkins University

Contact: contact@paradim.org, dienel@cornell.edu

Website: www.paradim.org

Summary of Poster: The Platform for the Accelerated Realization, Analysis, and Discovery of Interface Materials (PARADIM) helps users design and create new interface materials—materials that do not exist in nature—with unprecedented properties for the next generation of electronic devices.