Nanotechnology Collaborative Infrastructure Southwest

NCI Southwest

The NCI-SW is a collaboration between ASU, Rio Salado College, and Science Foundation Arizona.

ASU

SCIENCE foundation ARIZONA
INNOVATION AT WORK

RIO SALADO COLLEGE
A MARICOPA COMMUNITY COLLEGE

Three strategic goals:

- *Build a southwest regional infrastructure for nanotechnology discovery and innovation.*
- *Address societal needs through education and entrepreneurship.*
- *Serve as a model node of the NNCI.*

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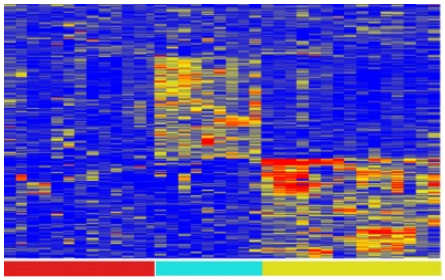
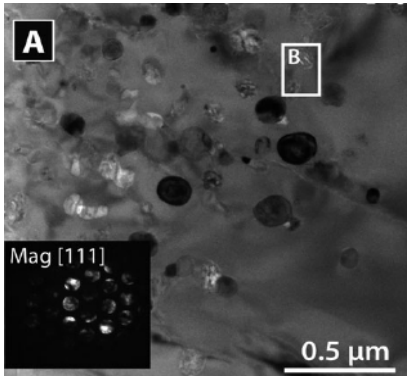


MUE Intracranial Healthy neoplasia

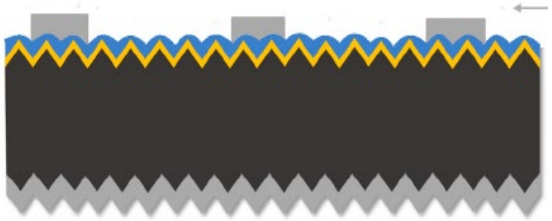
Peptide array distinguishes healthy dogs, from dogs with two common diseases (Virginia-Maryland College of Veterinary Medicine)

Six NCI-SW research centers provide R&D support for:

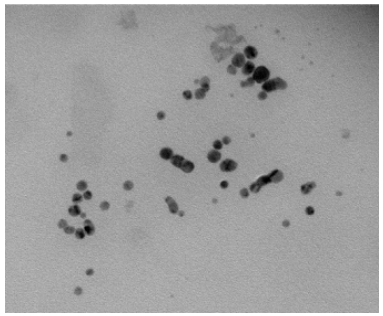
- Electronics, photonics, and MEMS fabrication and characterization
- Nanomaterials in the environment
- Photovoltaics pilot line
- Geological nanoscience
- Health-care innovation
- SEI of nanotechnology



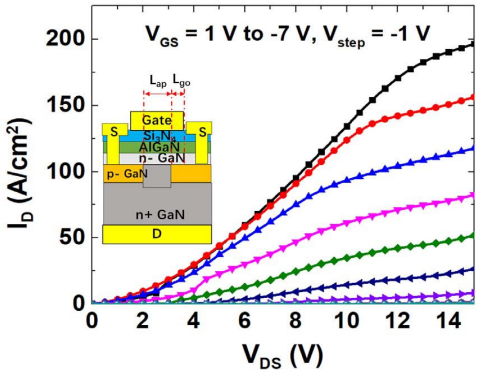
Fe- nanoparticles created by meteoric impact metamorphosis (MacEwan University)



hybrid photovoltaic device architecture (U. Delaware)



TEM images of silver nanoparticles from commercial Mesosilver (Univ. New South Wales)



I-V Characteristics of GaN vertical electron transistors (UC Davis)

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NCI-SW: Facilities and Tools

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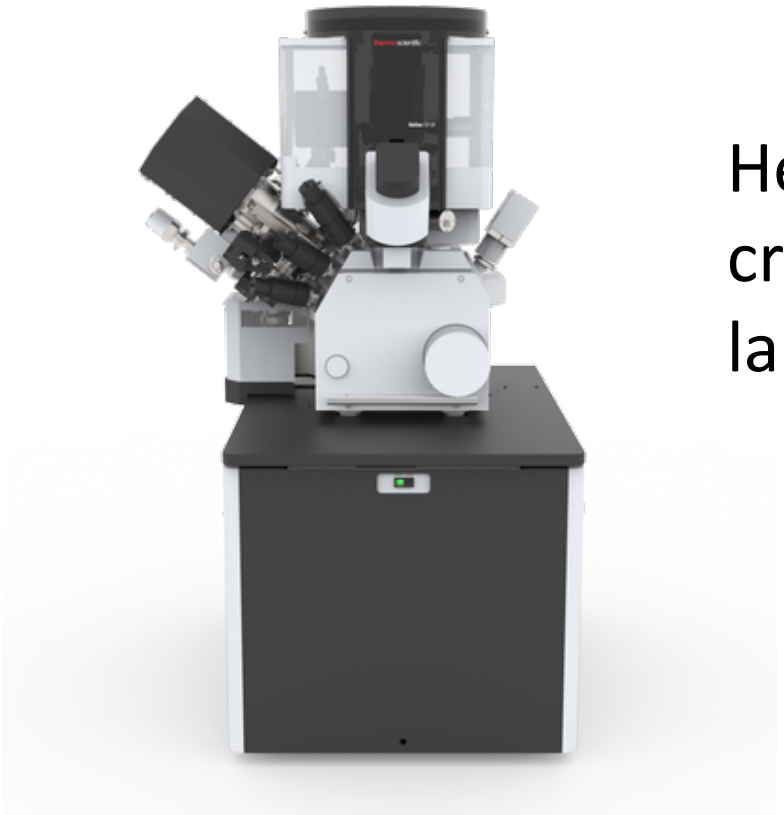
- New Focused Ion Beam Capability for 2019



Helios G4 UX FIB for the creation of ultra-thin TEM lamella with sub-nm damage.

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NCI-SW: Research Highlights

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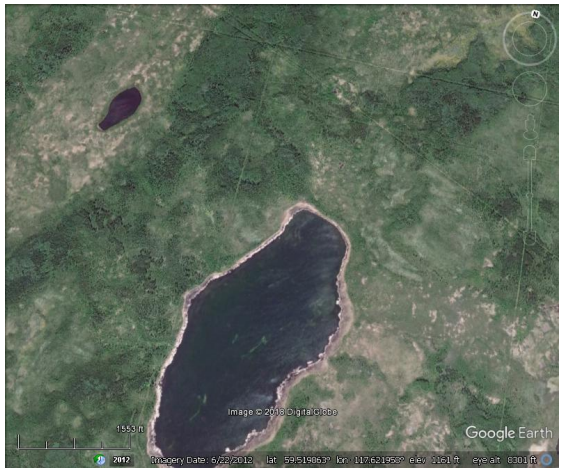
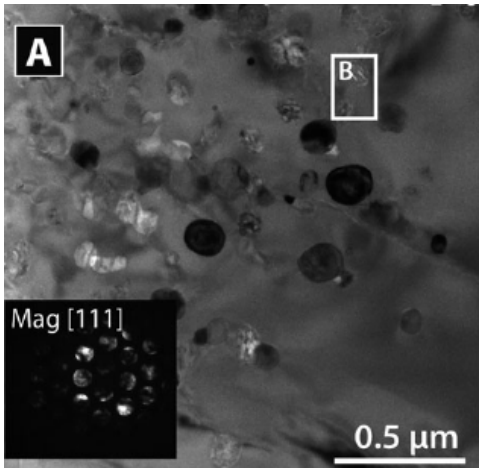
Research Highlight #1 - *Windows on the Universe*

"Investigating the Response of Biotite to Impact Metamorphism"

E. L. Walton,
Department of Physical Sciences, MacEwan University, Edmonton, Alberta

Temperature and pressure induced metamorphosis of silicates (mica) into garnet in the 25 km diameter crater left after a meteor collision > 90 million years ago





Fe- nanoparticles created by meteoric impact metamorphosis

Meteoritics & Planetary Science
vol. 53, pp. 75–92 (2018)

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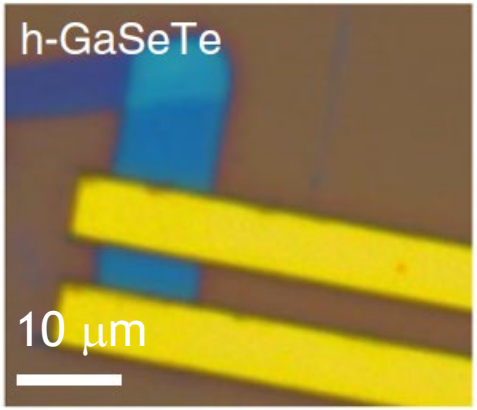
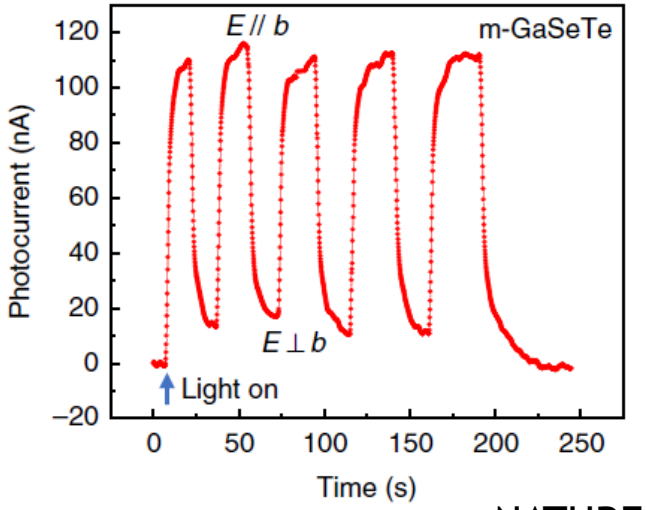
Research Highlight #2 – Two Dimensional Semiconductors

"$GaSe_{1-x}Te_x$ nanomaterials for Photonic Devices"

Sefaattin Tongay, School for Engineering of Matter, Transport and Energy, ASU

By stabilizing previously unobserved compositions and phases of $GaSe_{1-x}Te_x$ at nanoscales on GaAs(111), we demonstrate abnormal band bowing effects and phase instability region when components crystallize in different phases. Results highlight potential applications in photonic and electronics.





2D GaSeTe photodetectors with strong polarization dependent photocurrents

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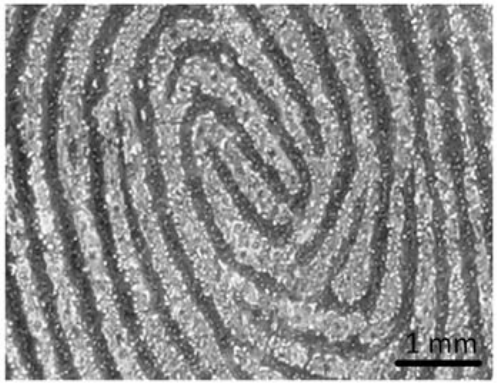
NATURE COMMUNICATIONS
DOI: 10.1038/s41467-018-04328-z

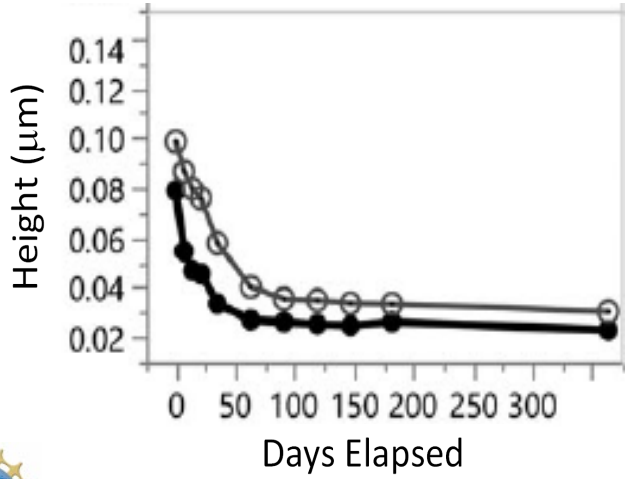
Research Highlight #3 – *NNCI CSI* *(Crime Scene Investigation)*

“Application of 3D Imaging Technology to Latent Fingermark Aging Studies”

Josep De Alcaraz-Fossoul
College of Criminal Justice and Forensic Sciences, University of New Haven, CT

In most latent fingermark aging studies, two-dimensional (2D) features are obtained from photo images, scans, or inked impressions. However, some relevant information is possibly being missed because fingermarks are three-dimensional (3D) objects that age in all three dimensions.





Latent fingermark ridge height as a function of days elapsed

NCI-SW: Education and Outreach

NCI Southwest

Visitors learn to use an optical microscope at Geeks' Night Out.

Antony Aguilar shows how to remotely operate a SEM.

The feedback helped us adjust our activities for the ASU Open door event

	2019	2018	2017	2016
	n = 21	*n* = 54	*n* = 32	*n* = 37
	% Agree and Strongly Agree	% Agree and Strongly Agree	% Agree and Strongly Agree	% Agree and Strongly Agree
This activity was fun and informative.	95%	77%	100%	100%
I am interested in learning more about this kind of activity.	81%	60%	100%	95%
I am familiar with key concepts in	76%	37%	72%	57%

NCI-SW: Societal and Ethical Implications

NCI Southwest

- The SEI User Facility sponsors Science Outside the Lab in Washington, DC each year taking students from across the NNCI to meet with policymakers to better understand how science influences policy and vice-versa
- This summer 15 students from eight NNCI schools participated.
- Dr. Jameson Wetmore is the Associate Director for SE in the NNCI CO

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NCI-SW: Computation

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- Dragica Vaslikeska directs the computational activities of the NCI-SW and is a long-time contributor to the NCN nanoHUB
- She has tallied 5,197 new simulation users on nanoHUB for calendar year 2018 and her lecture materials for 3 courses have been accessed by 111,207 users in the last 12 months.
- Dr. Vasileska is NOT supported by the nanoHUB. Her participation in the NCI-SW provides resources to disseminate her work
  e.g. through the web site pvrdfasp.com

PVRD-FASP SOLVER

A Unified 2D Solver for Modeling Transport of Charge Carriers and Point Defects

To get started please click here

A. Shaikh *et al.**, PVRD-FASP: A Unified 2D Solver for Modeling Carrier and Defect Transport in Photovoltaic Devices, submitted for publication to J. of Photovoltaics

* ASU, First Solar, Purdue, and San Jose State University

FUNDED BY:
SOLAR ENERGY TECHNOLOGIES OFFICE U.S. Department Of Energy
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NCI-SW: Impact

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Workforce Development

NCI-SW is collaborating with Rio Salado College to host advanced laboratory curriculum for students enrolled in their two-year, 62 credit AAS degree in Nanotechnology which contains an 18 credit Certificate of Completion.

Highlights include:

- Ten lab classes implemented through ASU
- 25-plus students have enrolled in the program since its debut in April 2017
- Eight students have graduated to date

  Production Technician at Cantel Medical
  Graduate student at Johns Hopkins University
  Undergraduate student at ASU
  Learning Designer Associate at ASU
  Manufacturing Operator at Apex Microtechnology
  Applying to Intel

Intel is Hiring Manufacturing Technicians

Intel is hiring hundreds of Manufacturing Technicians and Specialists. They are advertising the need for technicians with certificate and two-year degrees through online ads such as this.

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NCI-SW: Impact

NCI Southwest

Small Business Development

- Out of 154 external users through March 2019, 46 are from small companies
- Our long-term small business user, Laser Components DG, recently broke ground on a new building
- In the 16 years that LC-DG has been a small business user of the ASU NanoFab *they have grown from a single employee to 30 full time staff*.

The new facility for LC-DG

- Dragan Grubisic, founder of LC-DG, attributes their success "*in large part due to an ongoing collaboration with the NanoFab, and some of its associated faculty members*" *.

* https://fullcircle.asu.edu/features/nanofab-helping-businesses-navigate-nanotech-world/

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NCI-SW: Impact

NCI Southwest

Outreach to Rural Communities

Leveraging strong rural collaborations with Science Foundation AZ

RIO SALADO COLLEGE
A MARICOPA COMMUNITY COLLEGE

NAVAJO Preparatory School

NAVAJO TECHNICAL UNIVERSITY

ARIZONA WESTERN COLLEGE

EASTERN ARIZONA COLLEGE

Tohono O'odham Community College
Ñia, Oya G T-Taccui Am Hab E-ju

Central Arizona College

COCHISE COLLEGE

NCI-SW: Network Collaboration

NCI Southwest

- NSF Workshop and Science paper on nanomaterials in the environment

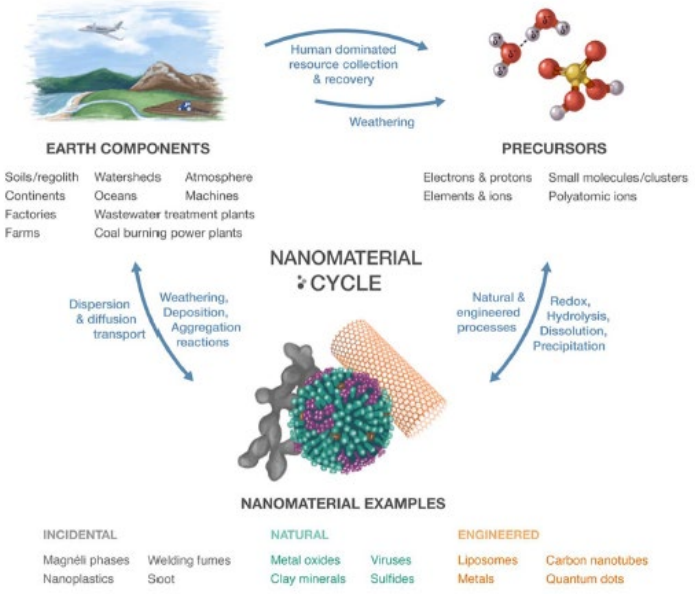
- Dr. Paul Westerhoff, Director of LCnano (NCI-SW), worked with Dr. Michael Hochella (NanoEarth) and Dr. David Mogk (MONT) as part of an NSF funded workshop focusing on nanomaterials in the environment.
- The workshop took place 19 – 22 April 2018.
- Follow up activities by these senior faculty from three NNCI sites lead to publication of a paper in *Science* magazine*

REVIEW SUMMARY

EARTH SYSTEM

Natural, incidental, and engineered nanomaterials and their impacts on the Earth system

Michael F. Hochella Jr.*, David W. Mogk, James Ranville, Irving C. Allen, George W. Luther, Linsey C. Marr, B. Peter McGrail, Mitsu Murayama, Nikolla P. Qafoku, Kevin M. Rosso, Nita Sahai, Paul A. Schroeder, Peter Vikesland, Paul Westerhoff, Yi Yang



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NCI-SW: Network Collaboration

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- Ray Tsui and Mary White sit on the Evaluation & Assessment Working Group

  - Dr. White lead a workshop on evaluation and assessment (E&A) for all the sites at the NNCI Annual Meeting in September 2018
  - As a follow-up, Dr. White worked with Quinn Spadola to design some common E&A questions that can be asked across the network

NCI-SW: Panel Discussion

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- Resource Allocation and New Equipment
  - ASU Core Facilities management asks for equipment needs from each facility
  - Needs are then prioritized by a committee of faculty and administrators

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