TEXAS STATE PREM | Partnerships for Research and Education in Materials | TRIANGLE MRSEC

The PREM Center: Interfaces in Materials – A Partnership of Texas State University and the Research Triangle MRSEC

PREM Director's Meeting

Friday, September 14, 2012

Texas State University – San Marcos

- Emerging Research University
- Total enrollment > 35,000
  - Hispanic Serving Institution
  - 87 Master programs, 12 PhD programs
- New PhD in Materials Science, Engineering and Commercialization (MSEC)
  - Biology, chemistry, biochemistry, physics, engineering
  - MS requirement for admission, entrepreneurship, small business
- The Department of Chemistry & Biochemistry
  - MS/BS in chemistry or biochemistry
  - > 400 UG majors
  - 22 tenure track faculty
    - 41% untenured, 27% female, 10% URM

Partnership with Research Triangle MRSEC
Duke, NC State, UNC, NC Central

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IRG 1 Team: Multicomponent Colloid Assembly by Comprehensive Interaction Design

Colloidal Assembly

Orlin Velev
(IRG 1 leader, NCSU)

Directed and programmed e-field assembly, Janus, and patchy particles

Benjamin Yellen
(IRG 1 co-leader, Duke)

Programmable magnetic field assembly, ferrofluids particle manipulation

Richard Superfine
(Senior Investigator, UNC)

Magnetic field micromanipulation, multiscale mechanics, matl. characterization

Theory and Computation

Carol Hall
(ΔMRSEC Co-PI, NCSU)

Molecular dynamics simulations – particle and molecule assembly and phases

Joshua Socolar
(Senior Investigator, Duke)

Quasiperiodic lattices critical dynamics in self-organizing systems

Patrick Charbonneau
(Junior Investigator, Duke)

Polymer, protein and particle soft matter, phase transitions, dimensionality

Synthesis/Integration

Gabriel Lopez
(ΔMRSEC PI, Duke)

Bionanomaterials, silica nanocontainers, microporous and functional films

Joseph Tracy
(Junior Investigator, NCSU)

Magnetic/anisotropic nanoparticle synthesis and assembly

Benjamin Wiley
(Junior Investigator, Duke)

Rod-like particles, open structures, nanoparticle films and nanomaterials

IRG2 Team: Genetically Encoded Polymer Syntax for Programmable Heirarchical Self-Assembly

Ashutosh Chilkoti

- Genetically encoded synthesis
- In situ DNA polymers
- Light scattering

Stefan Zauscher

- Polymer brushes
- In situ DNA polymerization
- AFM, SPR, QCM

Jan Genzer

- Controlled polymerization
- Ellipsometry, NEXAFS, Kerr effect

Michael Rubinstein

- Scaling theory of polymer self-assembly
- Computer simulations

Carol Hall

- Computer simulations
- Self-assembly of soft matter
- Protein aggregation

Yara Yingling

- MD simulations of DNA & syntactomers
- Structure-function of biomolecules

Gabriel López

- Hybrid responsive colloids
- surfaces
- membranes

Darlene Taylor

- Programmed thin film casting
- Polymer synthesis

Synthesis & Characterization | Theory | Simulation | Processing

PREM Center for Interfaces in Materials
Texas State University Team

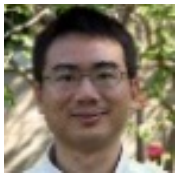
***Thrust 1*: Multiscale Colloid Interfaces**

Gary Beall

Jennifer Irvin

Bill Brittain, PI

Chad Booth



Luyi Sun

Ben Martin

***Thrust 2*: Regulatory Control of Polymer Self-Assembly into Functional Nanomaterials**

Tania Betancourt

Steve Whitten

***Thrust 3*: Propagation of Knowledge through Shared Mentorship: The Pipeline to Success in STEM Education**

Ozcan Gulacar

Ben Martin

Bill Brittain, PI

Tania Betancourt

Chad Booth

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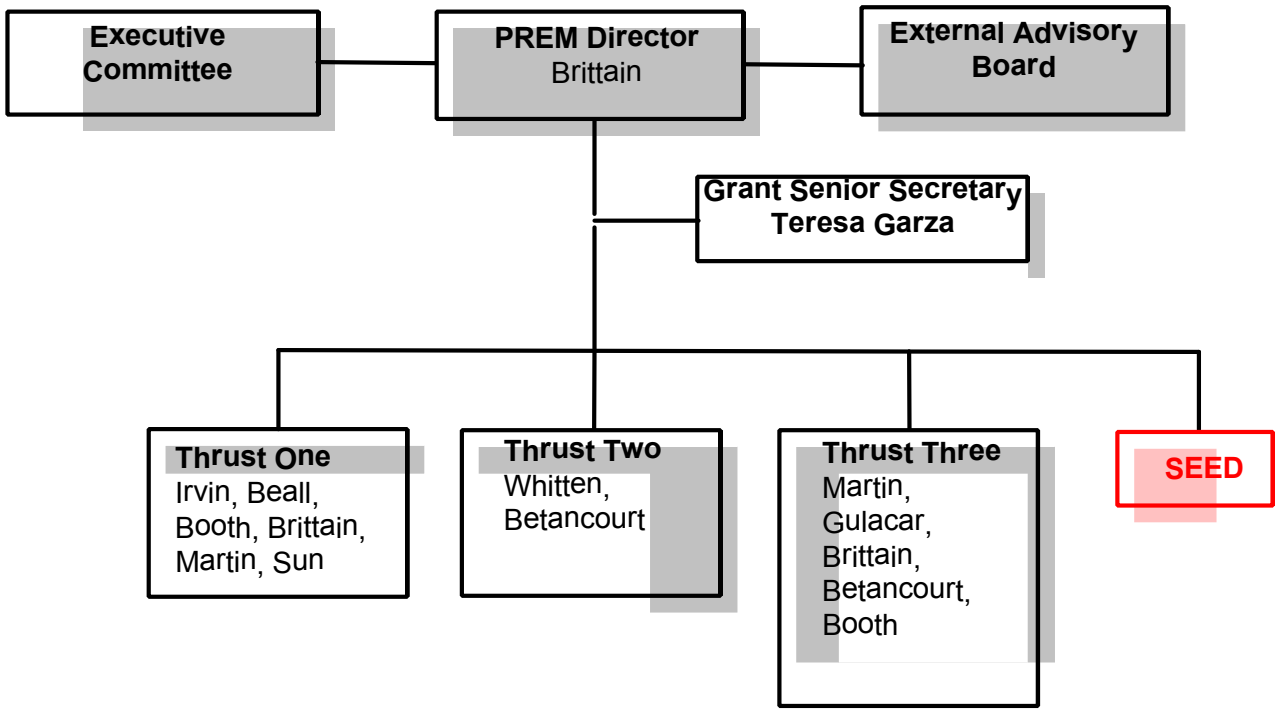
Texas State PREM Management Structure



External Advisory Board – two meetings/yr, one by video conference

Tim Demming (Bioengineering, UCLA)
Brian Windsor (Emergent Tech, Austin)
Dhiraj Sardar (UTSA PREM PI)
Don Patterson (Nanohmics, Austin)
M. I. Knudson (Rockwood Additives)
José Yacaman (UTSA Physics Chair)

Internal Executive Committee – six meetings/yr, 4 by video conference

William Brittain, Jennifer Irvin, Steve Whitten, Ben Martin
Stefan Zauscher, Gabriel Lopez, Yara Yingling

Ex-officio - Steve Seidman (Dean, College of Sci/Eng), Jamie Chahin (Dean, College of Applied Arts)

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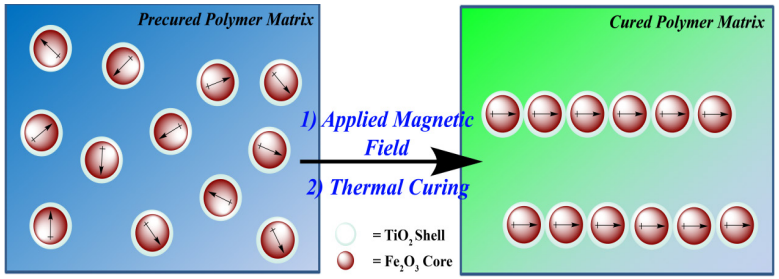
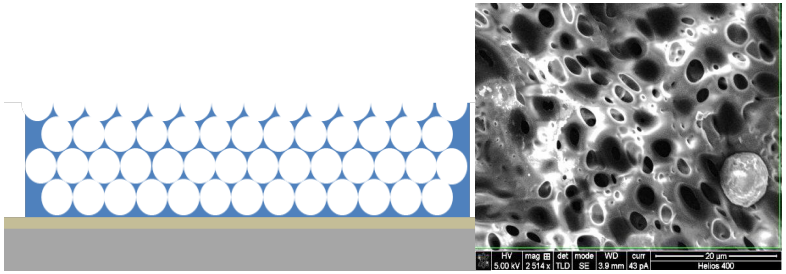
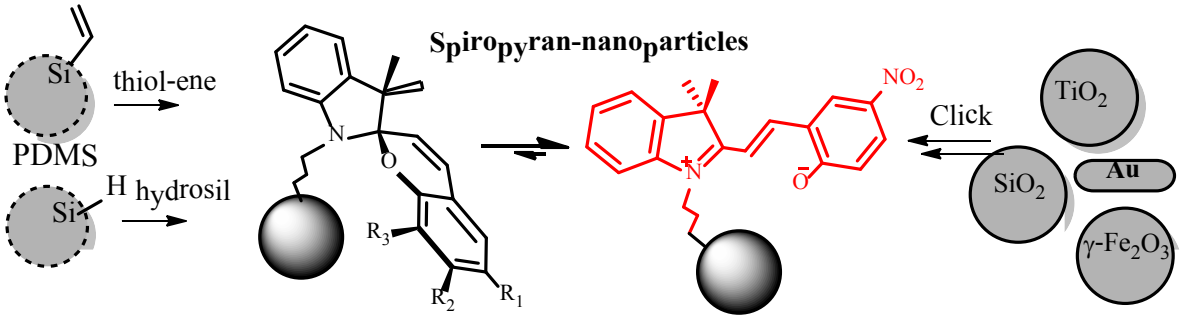
Thrust 1: Multiscale Colloid Interfaces



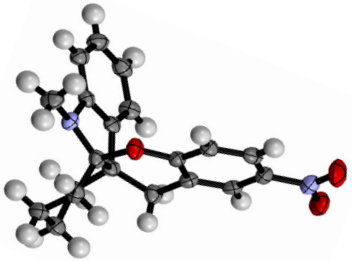
Magnetic orientation of polyimide nanocomposties for enhanced selectivity and permeability
TxState: Booth/MRSEC: Tracy

Templating effects on conducting polymer morphology and electrochemical properties (left: approach; right: result)
TxState: Irvin/MRSEC: Velev, Wiley





New chromophores



Photochemical control of assembly using organic chromophores in hybrid nanoparticle systems and self-assembling syntactomers
TxState: Brittain/MRSEC: Lopez, Zauscher, Genzer, Chilcoti

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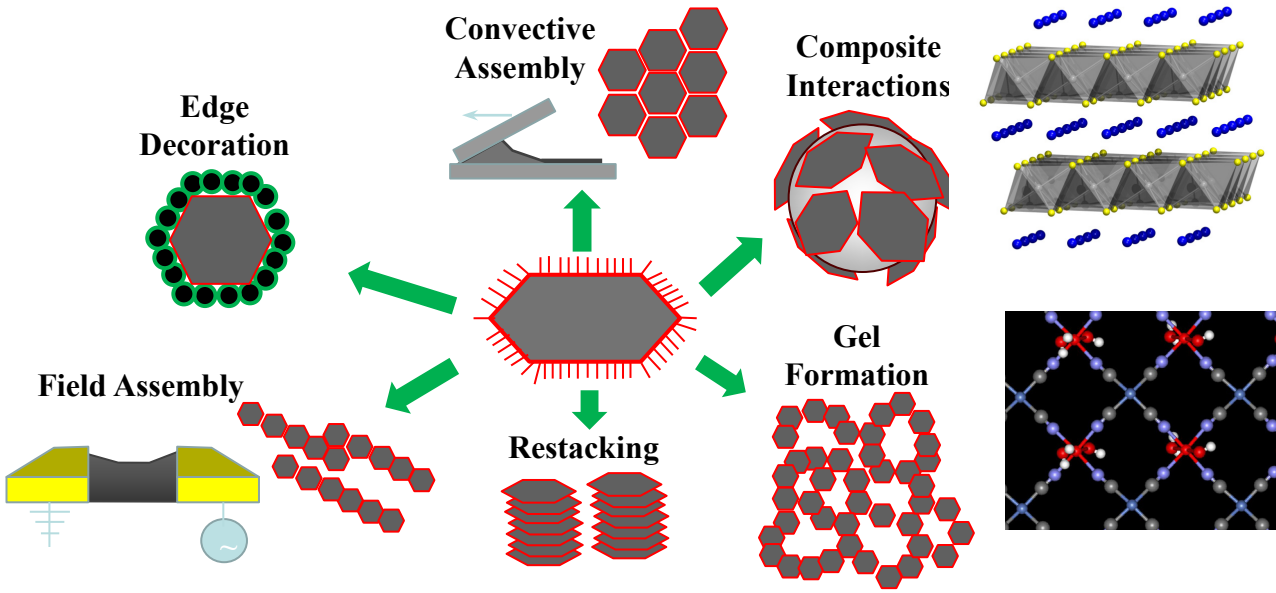
Thrust 1: Multiscale Colloid Interfaces

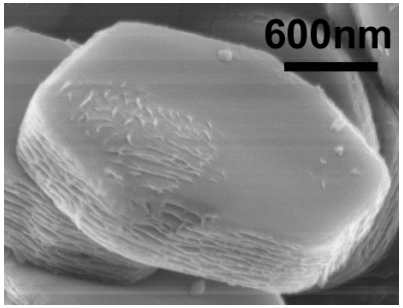
Directed Self-Assembly of 2-Dimensional Nanosheets

TxState: Beall, Martin, Sun
MRSEC: Hall, Lopez, Tracy, Velev, Wiley

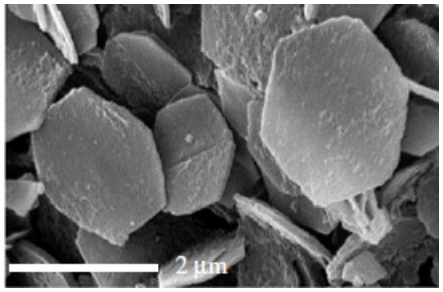


Metal Chalcogenides

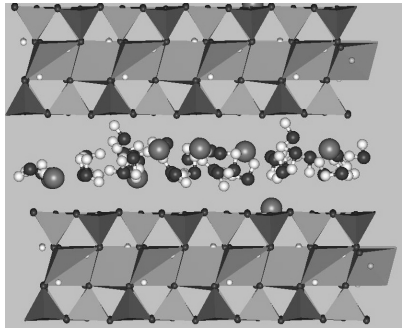
Metal Cyanides



α-Zirconium Phosphate



Layered Double Hydroxides



Smectic Clays

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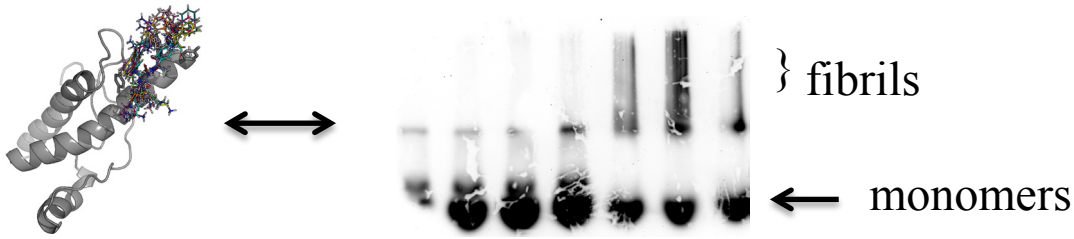
Thrust 2: Regulatory Control of Polymer Self-Assembly into Functional Nanomaterials

TxState: Whitten
MRSEC: Yingling, Hall

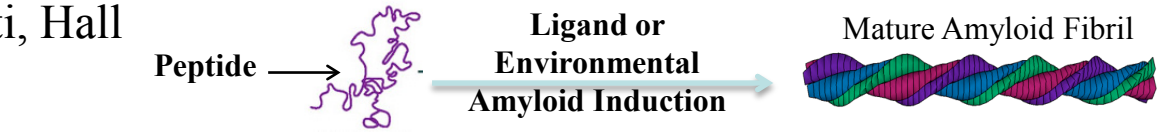
Regulatory Control of Polymer Self-Assembly



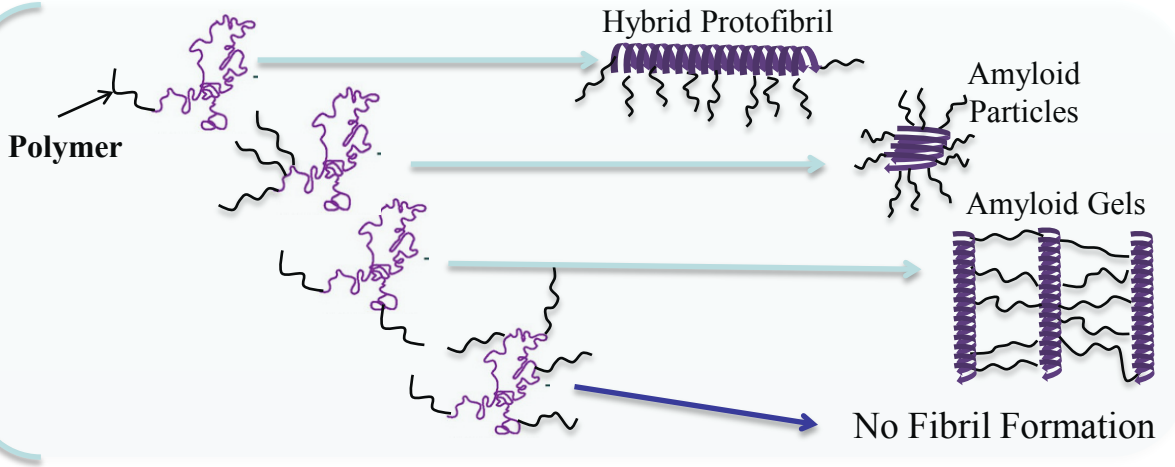
in silico design *in vitro* conversion

TxState: Betancourt
MRSEC: Chilkoti, Hall

Design of Functional Fibril Nanostructures



Modulation of Hybrid Amyloid Fibril Assembly via Polymer Functionalization



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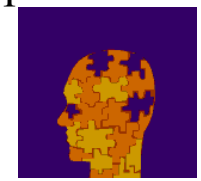
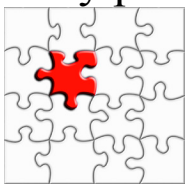
Thrust 3: Propagation of Knowledge through Shared Mentorship: The Pipeline to Success in STEM Education

Chemical Education Research:
Improving Teaching/Learning Experiences
TxState: Gulacar

•The nature of challenges in learning chemistry

•Cognitive and metacognitive aspects of chemistry problem solving





•Influence of guided-learning activities and educational technology on student performance

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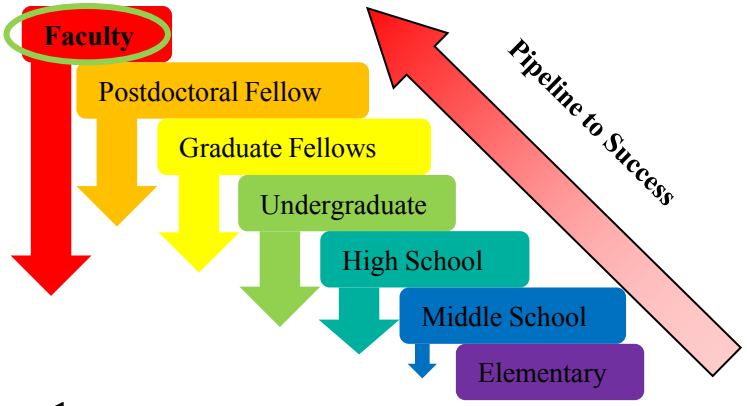
The Cascade of Mentorship



Planned Activities

- **Faculty** – six exchanges year 1

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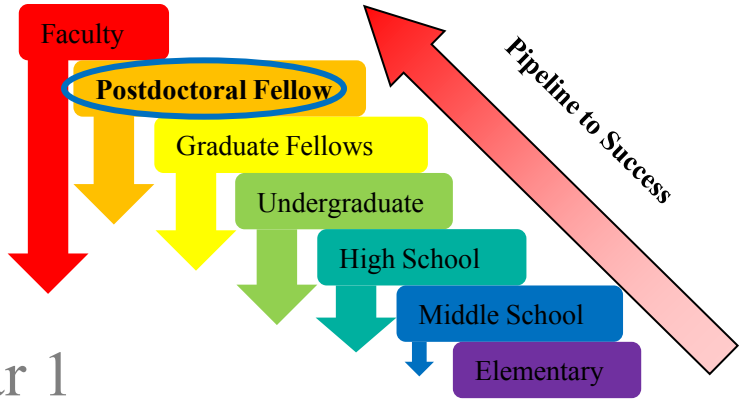

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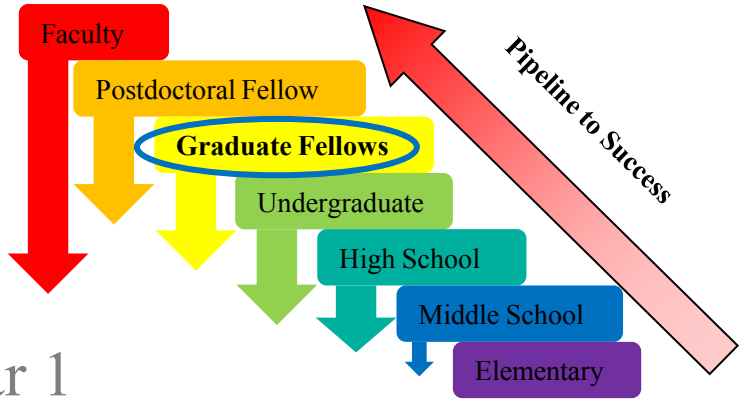

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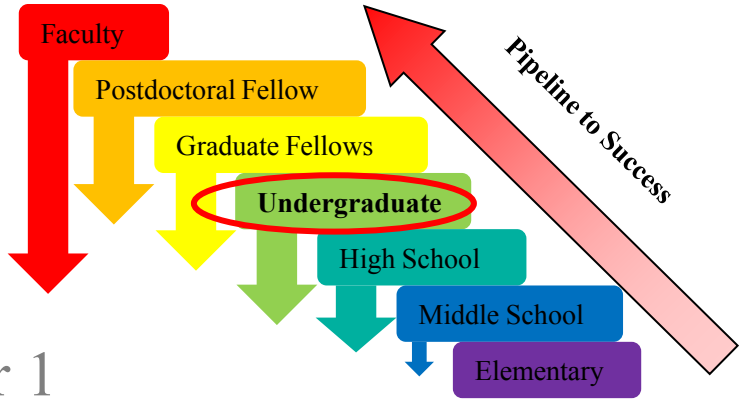

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- Four **PREM UGs** participate in MRSEC REU per year

Synergy with TxState REU *Che*mistry research community with a focus on *M*olecular *I*nnovation and *E*ntrepreneurship

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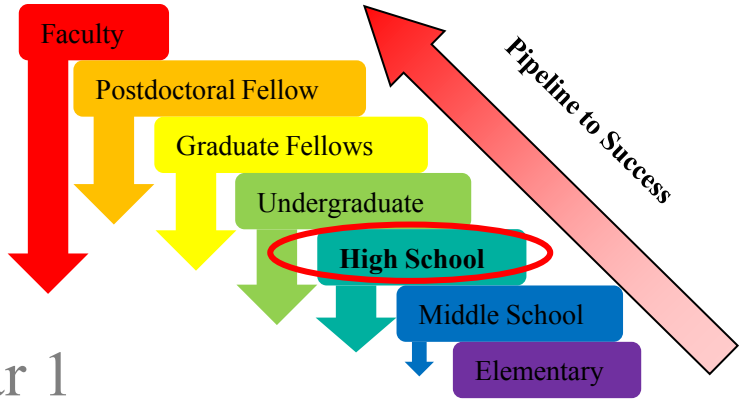

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- **PREM Academy**

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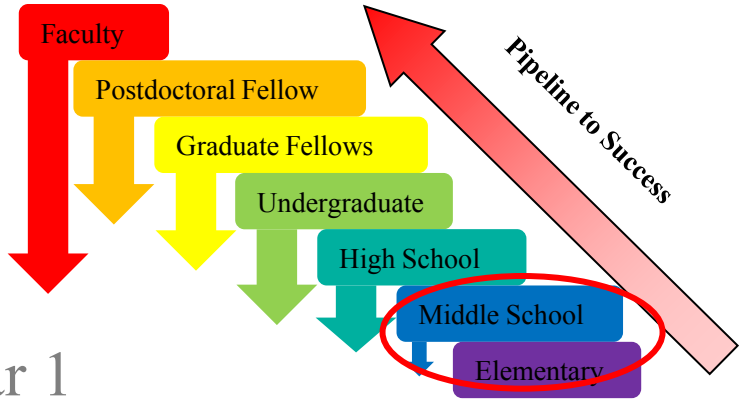
The Cascade of Mentorship



Planned Activities

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- Four **PREM UGs** participate in MRSEC REU per year
- **PREM Academy**
- **PREM Science Events**

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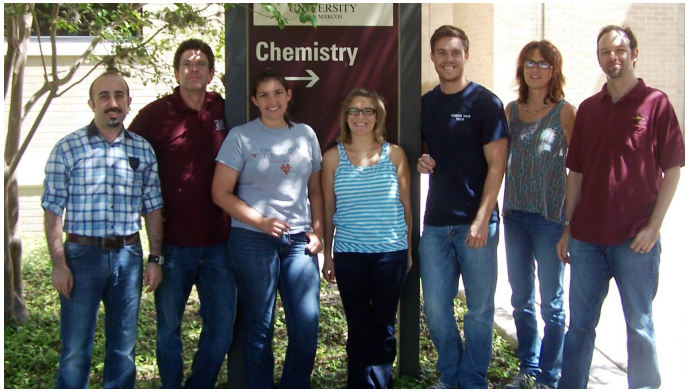
PREM Academy – Class of 2012



Mornings- Laboratory work
PREM Faculty

•surface chemistry
•colloids
•polymer nanoparticles
•photochromism
•superconductors

July 30 – August 3
-Stephanie Hart –Manor New Tech High
-Stuart Ray- Manor New Tech High School
- Abigail Randall-Akins High School-Austin
- Christina Jenschke-Akins High School-Austin

Afternoons – Project Development
Gulacar, consultants (UT Austin)
•Legacy Cycle – project units for TEKS (Texas Essential Knowledge and Skills)
•POGIL – process oriented guided inquiry learning
•Vernier Technology – LabQuest, probes and sensors

Kits will be provided to participants and modules disseminated on website.

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TEXAS STATE PREM

Partnerships for Research and Education in Materials

TRIANGLE MRSEC

Kickoff Meeting
August 17, 2012
Duke University

Agenda

Exec Comm Meeting	9:30 am
MRSEC Overview	10:30 am
TxState Overview	11:00 am
Individual research meetings	1:30 pm

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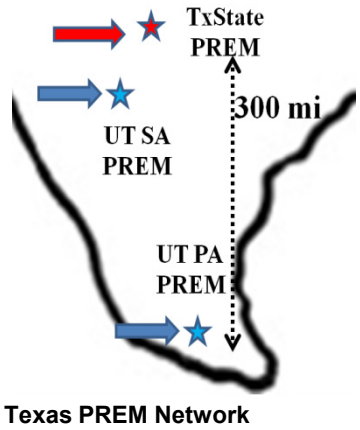
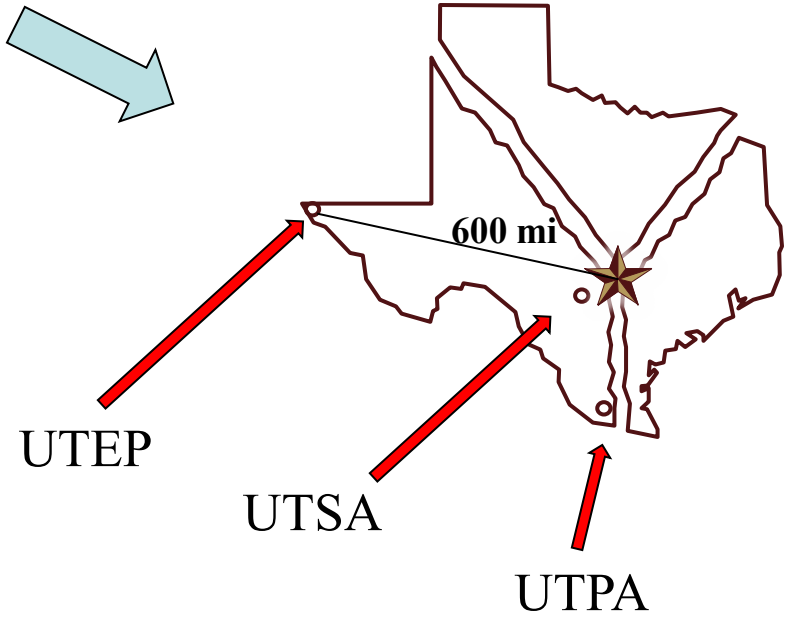
Texas PREM Network

From the proposal



South Central Corridor

Southwest Texas



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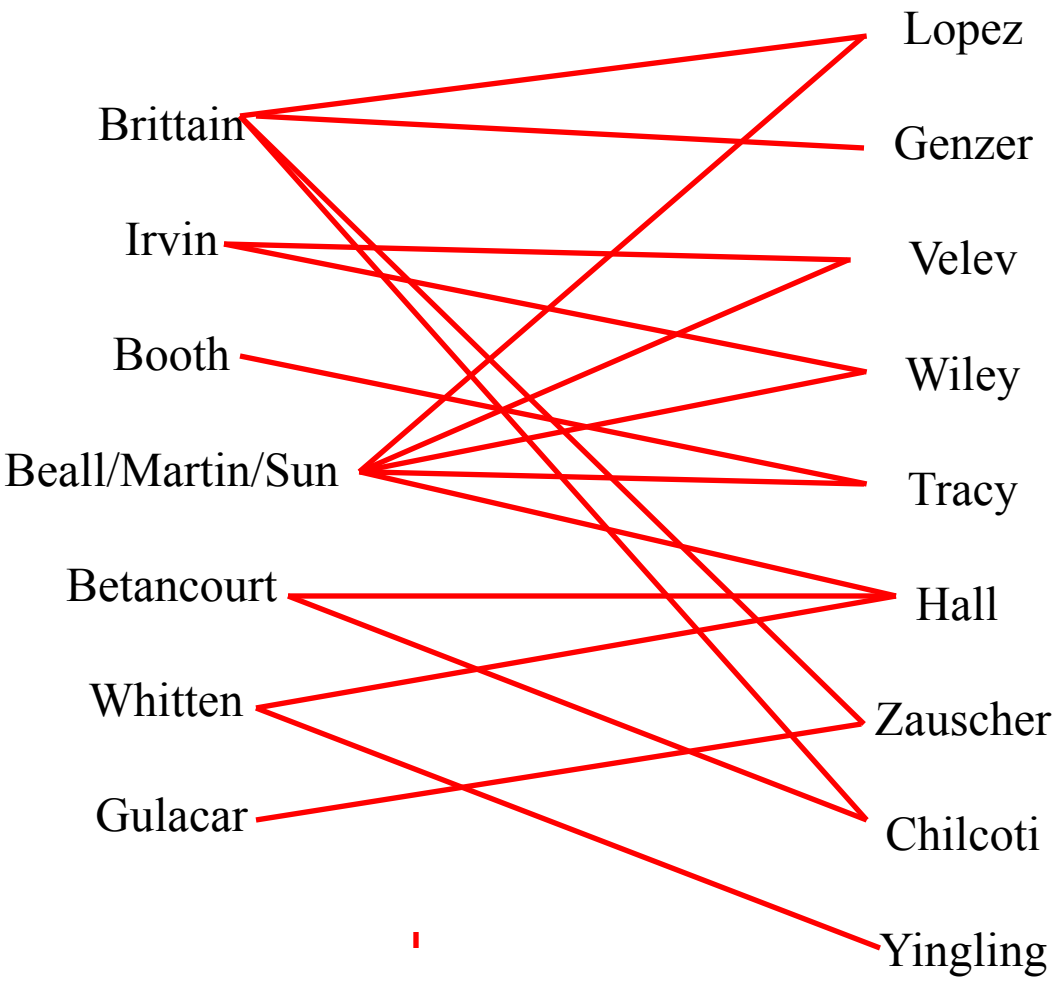
PREM-MRSEC Collaborations



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Team Science*

Interdisciplinary research is required for problems of sufficient complexity that a team is required – team science is the study of best practices. *Unique* PREM Challenges: infrastructure disparity, geography and cross-disciplines. Communication is essential.

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***http://www.sigmaxi.org/programs/issues/teamscience.pdf**

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http://www.cose.txstate.edu/prem/

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