Workshop to Build an EPSCoR Consortium to *Lead the Nation* on Innovating Nanoscale Ferroelectric & Multiferroic Science, Technology, and Workforce Development

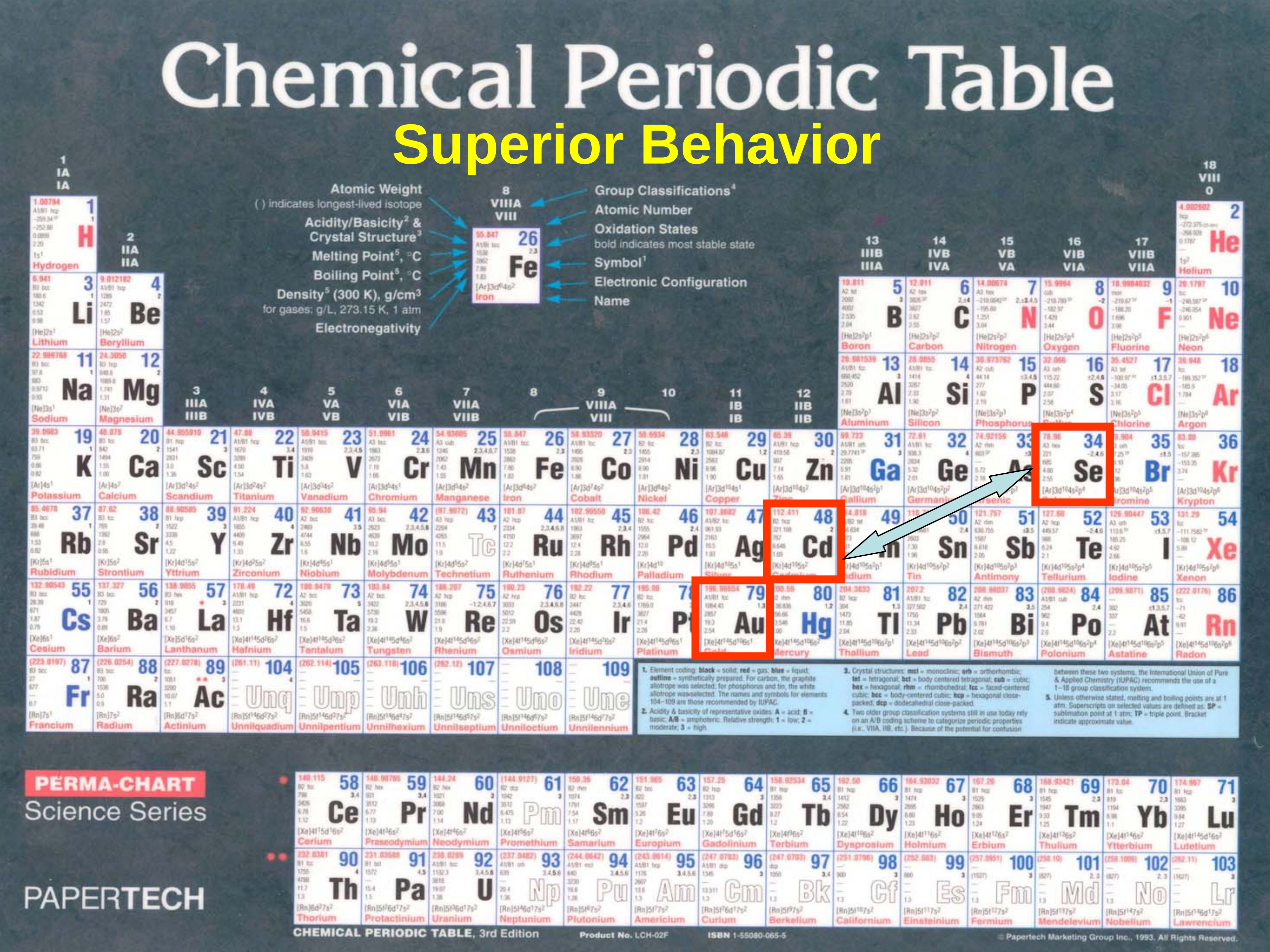
Why Nanoscale Ferroelectric & Multiferroic Science, Technology, & Workforce?

Driven by two science and technology opportunities:

1. **An exciting opportunity based on our ability to create new and novel materials that exhibit behavior that is superior to any we know. Imagine smaller, stronger, lighter, faster materials that are creatively used to innovate the next generation of high technology.**
2. **This opportunity is based on cyber infrastructure to develop nanoscale ferroelectric & ferromagnetic superlattices and arrays that are computationally designed in advance to have a desired behavior before they are fabricated, and then tested with the predicted behavior, and fabricated into devices.**

Imagine the power of this combination!

Superior Behavior



What is Special About Nanoscale Ferroelectrics and Multiferroics?

Electric Field Switches Semiconductor Behavior

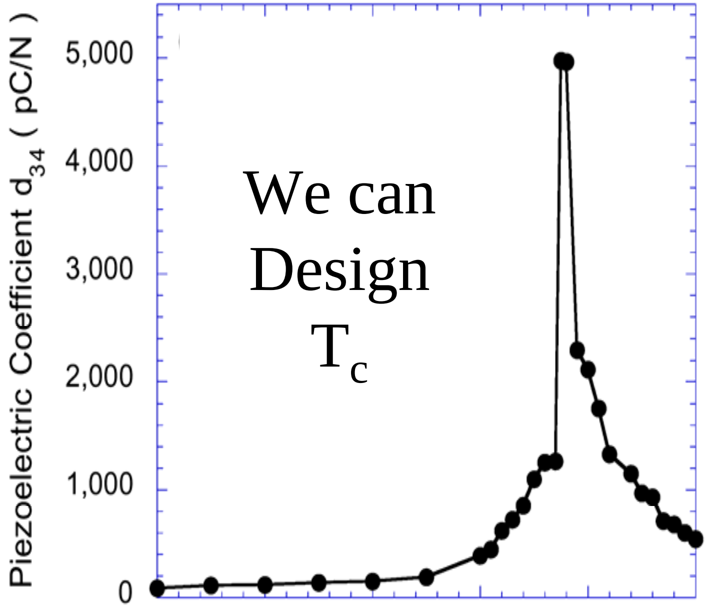
Semiconductor
Ferroelectric

Electric Field changes Magnetic Behavior

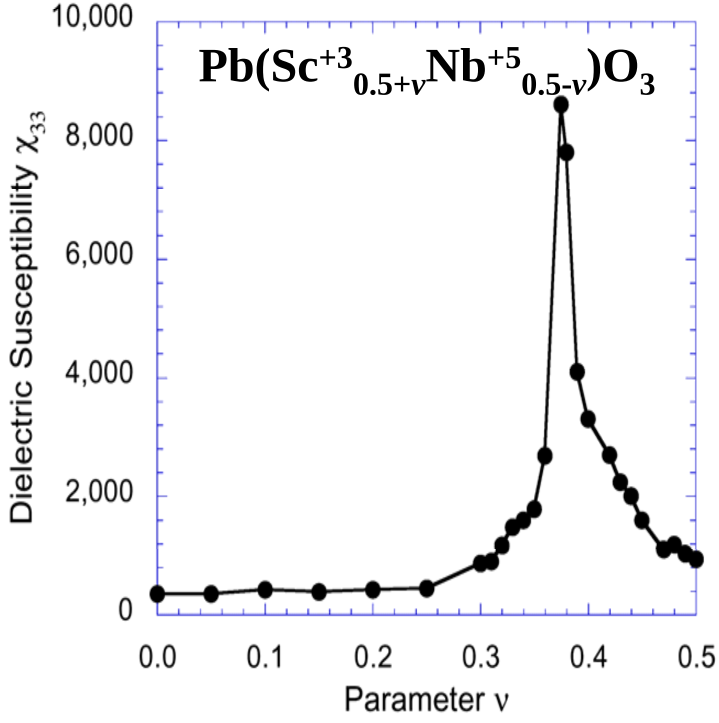
Magnetic
Ferroelectric

Magnetic Ferroelectric

Switching between Magnetic and Electric Behavior

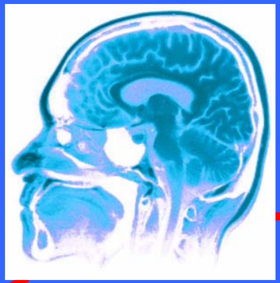


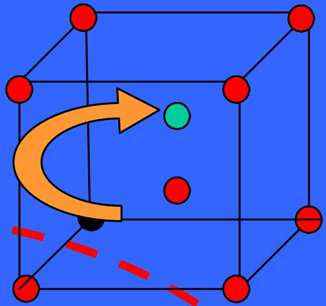
Ferroelectric



Potential Payoff is Difficult to Overestimate

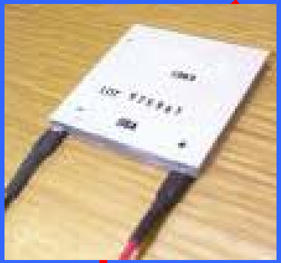
Sensitive IR/Magnetic Field Sensors

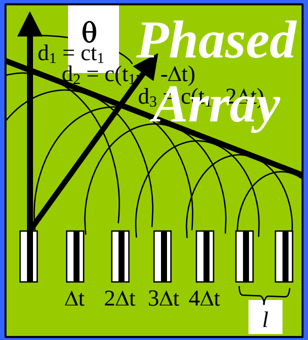


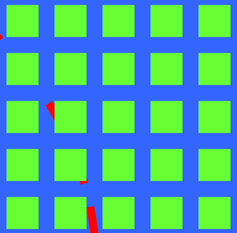


Faster-Lower Power Memory Cell

Thermoelectric to convert waste heat to electricity

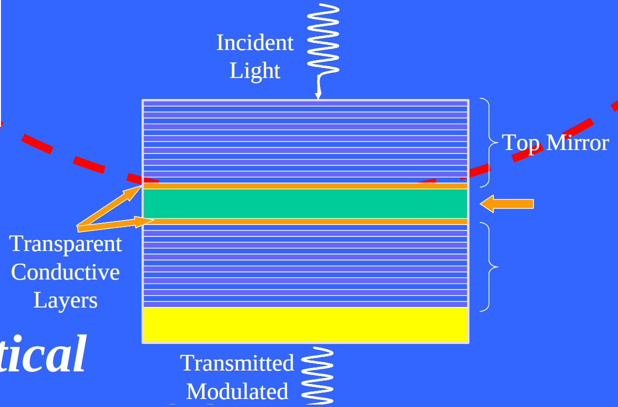




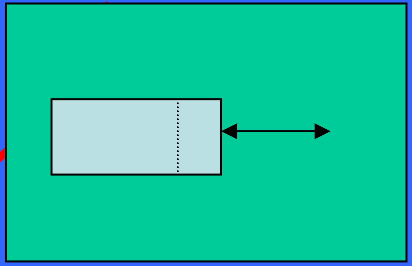


New Era of Electronics based on a new paradigm

Invisible Material



Ultra-fast Optical Switch



Fast-Giant Displacement Piezo Actuators

Consortium

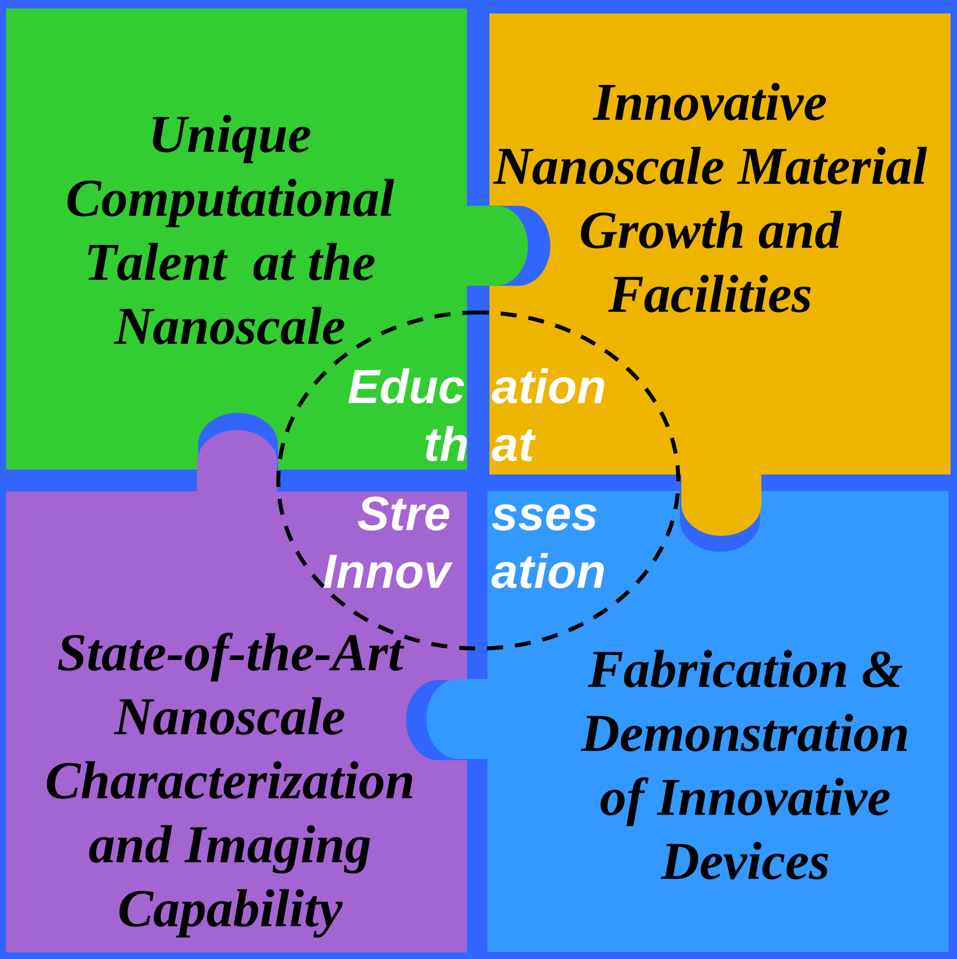
Despite this potential, there is currently no such innovative material/device effort in the U.S. *However, this talent does uniquely exist today among several of the EPSCoR states.* A consortium will bring together this unique interdisciplinary mix of people, ideas, and tools to have a larger impact, breaking down the barriers that prevent realization of this vast potential.

This is something that no single institution can do effectively on its own.

But A Consortium of EPSCoR States can

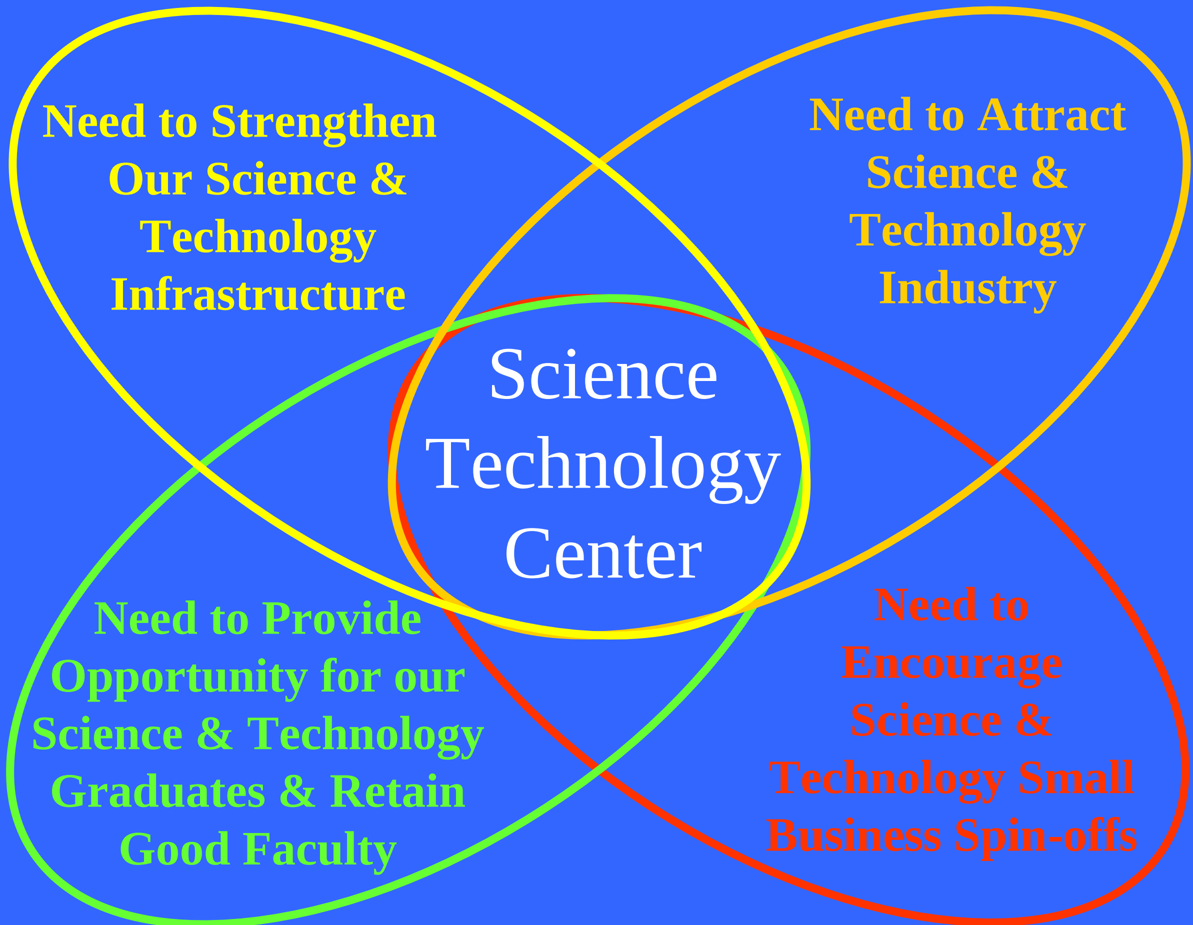
Bring The Needed Pieces Together

To Compete for a Science and Technology Center on Nanoscale Ferroelectrics and Multiferroics that can have this Technology Impact



Moreover, the Proposed STC Consortium can have a Big Impact on many of the Needs EPSCoR States have in Common.

Innovation through an STC is Key



How do we Achieve a Competitive Consortium?

One approach is where one person selects partners and then writes the proposal for an NSF Center with partners just looking on

What We Need To Avoid!

A Second approach takes the word "team" to mean that one person tells everyone what to do to write a competitive proposal for an NSF Center

But a Workshop has the best chance to help us achieve the right mix of people, ideas, and tools to form a competitive NSF Center proposal

The Workshop Is Built Around a solicitation that resulted in 45 participants from 12 EPSCoR States and Structured into 7 Parts:

- Growth
- Theory/Modeling
- Characterization and Imaging
- Device Fabrication and Demonstration
- Human Resource Development
- Innovation and Technology Transfer
- STC Proposal Building

While Each Person Presents a 10 minute Discussion Each Participant Answers the Following for each of the 7 Parts as it Applies to a Competitive STC Proposal

“GROWTH” PART

YOUR NAME:
YOUR DISCIPLINE / EXPERTISE:

Strengths:

Uniqueness:

Need for Addition:

Potential for Scientific, Technological, or Educational Breakthroughs:

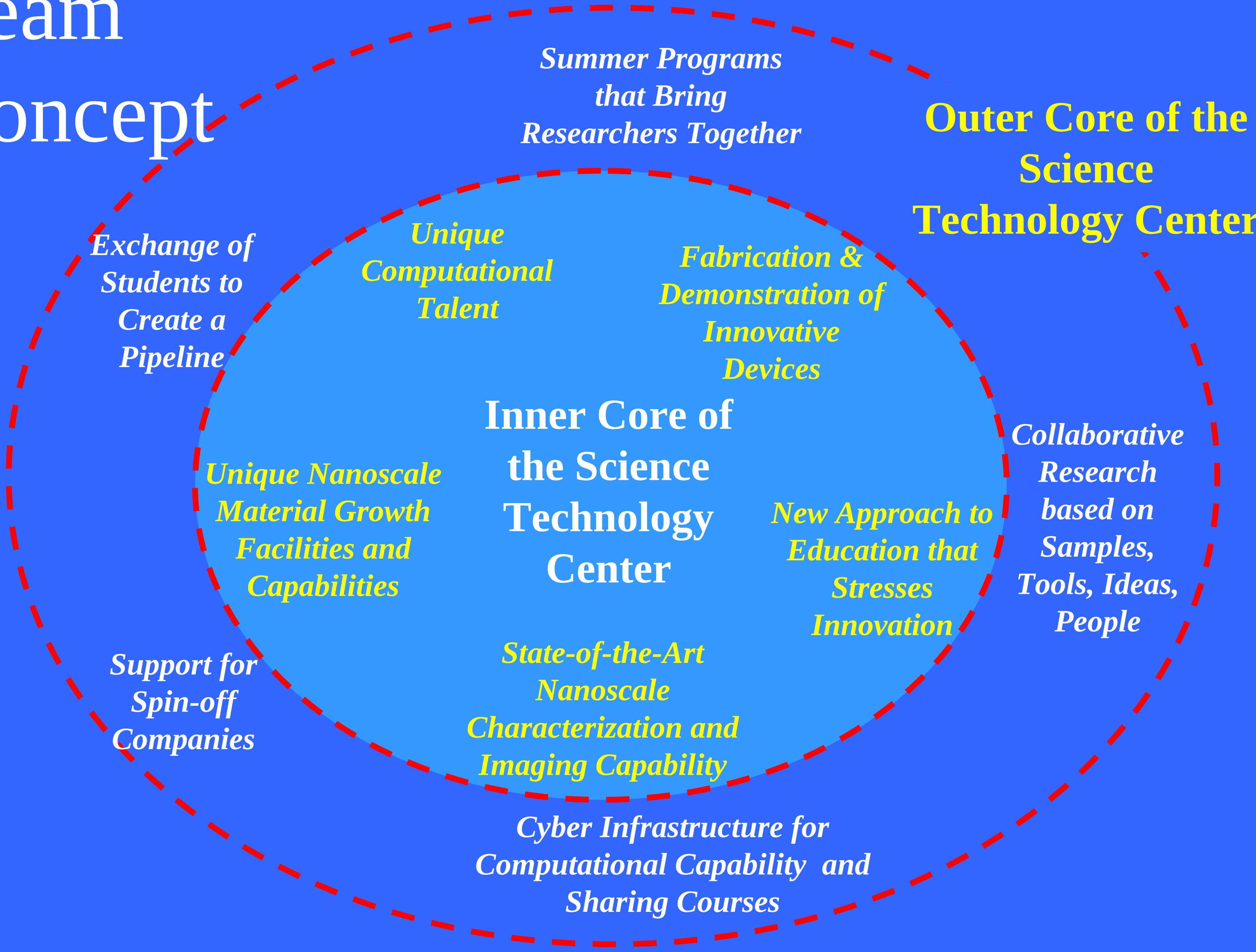
Expected Challenges:

Possible National Impacted:

Suggest Focus:

Suggested Strategic Goals:

Team Concept




NEED CASH
For STC
RESEARCH

I Need Your Help

"Institutional Commitment (one-page limit). Provide a synopsis of institutional and other support of the proposed Center. Outline the lead institution's commitment: space (new space and/or renovations to existing facilities), faculty and staff positions, capital equipment, and access to facilities and instrumentation. Major commitments of partner institutions should also be described. Describe how the commitment contributes to realizing the strategic goals of the integrated Center. Describe support from all other sources that has been committed, including space, facilities, and personnel for the Center. Note that cost sharing is not required; voluntary cost sharing, if provided, will not influence the review process."