Transdisciplinary Discovery and Convergence: The Coming Focus for Tackling Grand Challenges

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The Endgame

• Key **issues or impediments** one faces in applying transdisciplinary approaches/convergence, especially to grand challenge problems

• Specific **actions that research officers can take**, or **ideas they can apply**, to help their faculty be more successfully in applying transdisciplinary/convergence concepts to research in general or grand challenges in particular

• Questions to help us all better **understand and improve the application** of trans-disciplinary research and convergence practices
The Challenge of Preventing Tornado-Related Deaths and Injuries: The Year is 1953 (519 Deaths)
TORNADO WARNING
NATIONAL WEATHER SERVICE JACKSON MS
1155 AM CST SUN FEB 21 2012

*TORNADO WARNING FOR...
NORTHERN SUNFLOWER COUNTY IN NORTHWEST MISSISSIPPI
TALLAHATCHIE COUNTY IN NORTHWEST MISSISSIPPI
QUITMAN COUNTY IN NORTHWEST MISSISSIPPI

* UNTIL 1 PM CST

* AT 1155 AM CST...A TORNADO WAS REPORTED BY THE PUBLIC AND INDICATED
BY RADAR 5 MILES NORTHEAST OF CLEVELAND...AND IS MOVING TOWARD THE
NORHEAST AT 55 MPH.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

IF THREATENING CONDITIONS ARE SIGHTED...BE PREPARED TO MOVE TO A
PLACE OF SAFETY. TO REPORT A TORNADO OR OTHER SEVERE WEATHER...PLACE
AN EMERGENCY CALL TO THE JACKSON MS NATIONAL WEATHER SERVICE OFFICE
AT 601 939 5751...OR ASK THE NEAREST LAW ENFORCEMENT AGENCY TO RELAY
YOUR REPORT TO THE NEAREST NATIONAL WEATHER SERVICE OFFICE.
BULLETIN – EAS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE JACKSON MS
1155 AM CST SUN FEB 21 1971

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Courtesy:  Alan Gerard and Lans Rothfusz
Translation to Graphics
The Challenge of Preventing Tornado-Related Deaths and Injuries: The Year is 2011 (550 Deaths)
The Traditional **Disciplinary** Approach

- **Meteorology Education and Training**
- **Technology** (Computer Models, Radar, Satellites, etc)
- **NWS Forecasters, Private Sector Meteorologists, Radio and TV**
Multi-Disciplinary Approach: Tackling Problems at the Boundaries Together

Meteorology Education and Training

Technology (Computer Models, Radar, Satellites, etc)

NWS Forecasters, Private Sector Meteorologists, Radio and TV

Research to Operations Test Beds

Social, Behavioral and Economic Sciences
Trans-Disciplinary Approach: Tackling the Grand Challenge in an Integrative Manner with New Methodologies Born Out Of Shared Thinking and Approaches
Grid-Based Probabilistic Threats

Obs & Guidance

The Forecaster

Threat Grid Tools

Useful Output

Effective Response

Verification

Integrated Social, Behavioral & Economic Sciences
For the Discussion Period...

• Key **issues or impediments** one faces in applying transdisciplinary approaches/convergence, especially to grand challenge problems

• Specific **actions that research officers can take**, or **ideas they can apply**, to help their faculty be more successfully in applying transdisciplinary/convergence concepts to research in general or grand challenges in particular

• Questions to help us all better **understand and improve the application** of trans-disciplinary research and convergence practices
Key Points for Discussion

• Key **issues or impediments** one faces in applying transdisciplinary approaches/convergence
  – **Semantic barriers** even when using the same language
  – **Role** confusion – who does what?
  – **Virtual work** is difficult
  – Institution-specific overhead, cost-sharing **structures** and different faculty teaching/service **expectations**/schedules
  – Lack of **incentive and credit structures** that both reward convergence activities and continue to support strong disciplinary scholarship. Not an either/or issue.
  – **Balancing** the trade-off between depth of knowledge and breadth of knowledge when designing integrated curricula
  – Scale and external **connectivity**
  – How best to **cultivate** locally, regionally, nationally
Key Points for Discussion

• Specific actions that research officers can take, or ideas they can apply
  – Provide opportunities for science team development at all levels (students, faculty, staff)
  – Provide leadership development opportunities
  – Provide clearly articulated promotion and tenure criteria for evaluating individual contributions to team-based research
  – Establish institutional seed funding programs (e.g., Mcubed)
  – Look for ways to increase co-location and the ability of diverse faculty to bump into each other
  – Exploit potential generation gap in which the next generation of researchers increasingly see convergence/transdisciplinary as a normal or expected research framework
  – Support Kavli/NASEM effort and encourage G-U-I-F nexus
Key Points for Discussion

• Some questions to **understand and improve application** of trans-disciplinary research and convergence practices
  – How can **collaboration** among faculty be fostered across a university disciplinary structure?
  – How can **students** be integrated into team science efforts and benefit from the experience?
  – How can a growing **culture** of interdisciplinarity thrive alongside those who wish to conduct disciplinary work?
  – How to **share** exemplary approaches
  – How to tackle grand challenges **regionally**?