From the Eye of the Storm: Science in the Wake of Hurricane Katrina

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http://www.cbr.tulane.edu/
http://kerrn.org
Tulane/Xavier Center for Bioenvironmental Research

- Inter-, multi-, and transdisciplinary research
- Major strengths such as Programs in Systems Biology and Translational Research; River-Coastal Studies; Arts and the Environment
- Established collaborations between Schools of Arts and Sciences, Engineering, Medicine, Public Health, Pharmacy, Architecture and Law in a major research university and an historically black university
Concept for an Academic/Public/Private Center for Mississippi River Studies and Knowledge in New Orleans Develops in 1998
RiverSphere is a Tulane University place for art, science, and technology, about rivers, for river communities, on the New Orleans Mississippi riverfront.
Sustainability, Survivability, and the Paradox of New Orleans

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Not just a dot on a map or a line in a database—but a home with a family.
Katrina Environmental Research and Restoration Network (KERRN)

interdisciplinary research and learning, in the right place at the right time.

Greater New Orleans, April 24, 2005

Same Area, September 6, 2005

Landsat imagery courtesy USGS; processing by R. Campanella, CBR
(excerpted from Geographies of New Orleans: Urban Fabrics Before the Storm, due out 2006)
"The Mother of All Multi-Disciplinary Problems"

Sociology/Anthropology
History
Computer Science
Environmental Science/Toxicology
Communication
Geography/Mapping Sciences
Meteorology
Economics
Soil Science
Engineering

Public Health/Medicine
Architectural Design
Urban Planning
Biology/Ecology
Oceanography

Interpretation of flooded area by Dartmouth Flood Observatory, based on Landsat, SPOT, and MODIS imagery of August 30-31, 2005. Path and wind speeds based on National Hurricane Center storm advisories. GIS processing and map by R. Campanella.

Map and analysis by R. Campanella, CBR (excerpted from Geographies of New Orleans: Urban Fabrics Before the Storm, due out 2006)
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THE START OF KERRN*

- Network conceived and proposed to NSF in September
- Research and program team started to populate New Orleans in mid October
- Started to rehab labs and core facilities in mid November. KERRN funded early November
- *Katrina Environmental Research and Restoration Network (kerrn.org)
KERRN MEMBER INTERESTS

- Human and Social Systems (49)
- Geoscience and Coastal Systems (24)
- Built Systems and Engineering (21)
- Interdisciplinary/Humanities (5)
- Biological and Ecological Systems (25)
- Human and Public Health (23)
Katrina Environmental Research and Restoration Network (*kerrn.org*)

- Centralized information source for research plans, outcomes and ideas
  - Virtual brainstorming
- Network of skills and interests
  - Matching research needs and skills
- Nucleating center or coordination node
  - Investigators from regional to international
- Facilitate communication between investigators
  - Web based
  - Face to face meetings
RESULTS OF WORKSHOP HELD IN NEW ORLEANS NOVEMBER, 2005
Science and Engineering Changing in the Academy and Region

- Tulane integrates science and engineering in the School of Science and Engineering
- School of Science and Engineering collaborates with University of New Orleans College of Engineering
- State Levee Board(s) (Engineering) integrating with Coastal Restoration Authority (Science) into single entity
What we learned as practicing scientists

• Be portable and redundant
  – Lap tops
  – Portable hard drives
  – Alternate email accounts
  – Reagents in liquid nitrogen when possible
  – Materials with collaborators, when possible
  – Get your kids to teach you to text message
### Scientist

<table>
<thead>
<tr>
<th></th>
<th>Pre (preparation)</th>
<th>During (response)</th>
<th>Post (recovery)</th>
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<tbody>
<tr>
<td><strong>Data</strong></td>
<td></td>
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<tr>
<td>backup onto portable storage devices and bring off-site</td>
<td>continue collection / analysis / sharing</td>
<td>restore and append onto existing infrastructure</td>
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<tr>
<td><strong>Operations</strong></td>
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<tr>
<td>power down critical equipment, store experiments in nitrogen</td>
<td>maintain / monitor status of stored experiments</td>
<td>restore electrical equipment and transfer experiments</td>
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<td><strong>Research</strong></td>
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<td>define remote setup location for continuation of research activities</td>
<td>coordinate and activate remote research location</td>
<td>de-activate remote location, transfer new data, foster interdisciplinary collaborations</td>
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<tr>
<td><strong>Personnel</strong></td>
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<td>establish alternative communication / collaboration channels (e-mail, web, mobile phone, shared online resources)</td>
<td>activate and maintain alternative communication / collaboration channels</td>
<td>resume, re-establish original modes of communication</td>
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• 30 million cubic yards managed by USACE between 9/05-12/31/05

• Integrated Waste Management: 1) source reduction, 2) reuse, 3) recycling, 4) treatment, 5) disposal (requires science at the table well in advance of a disaster)

3 dump sites in Orleans Parish illustrate the magnitude of Katrina’s destruction

MOUNTAINS OF DEBRIS

Coastal Restoration

Deconstruction

Composting
MOLDS ARE PREVALENT IN NEW ORLEANS

MOLDS FOUND POST KATRINA

Aspergillus, Penicillium, Wallemia, Cladosporium, Alternaria, Aspergillus, Fusarium, Trichoderma

(Trichoderma, a common soil organism was most common. Stachybotrys, the “sick building” mold was not found)

Analysis of her own home by Tulane mycologist, Dr. Joan Bennett in ANYAS, Jan-Feb 06
What are the big science challenges

• Application of science to rebuilding and re-inhabiting a city (the science of rebuilding)
• Exploring and understanding the interface of the built and natural environments
• Principles for creating resilient and sustainable urban ecosystems
TO CREATE AN URBAN ECOSYSTEM

- Collaboration between natural sciences and engineering,
- But then the big step to social, behavioral sciences and economics
- And finally the huge step to the arts and humanities
- All needed to inform policy
New Orleans and Surrounding Area as a Model Ecosystem

- Like it or not, we are a natural laboratory
- Scientists, engineers, architects and urban planners from around the world are coming to study the region (e.g. satellite center for Japanese teams)
- City-wide consortium (lab without walls) committed to working smart
- New Orleans region is a focus for world wide student involvement and education in all aspects of science and society