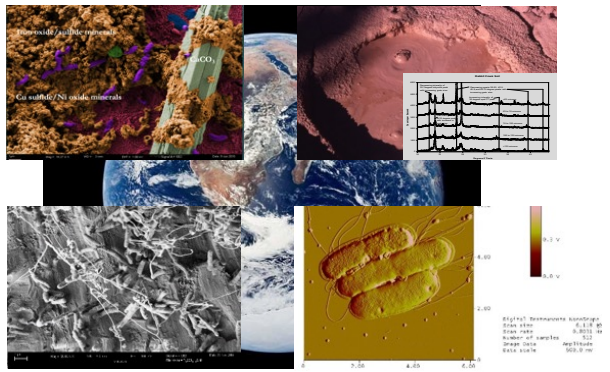
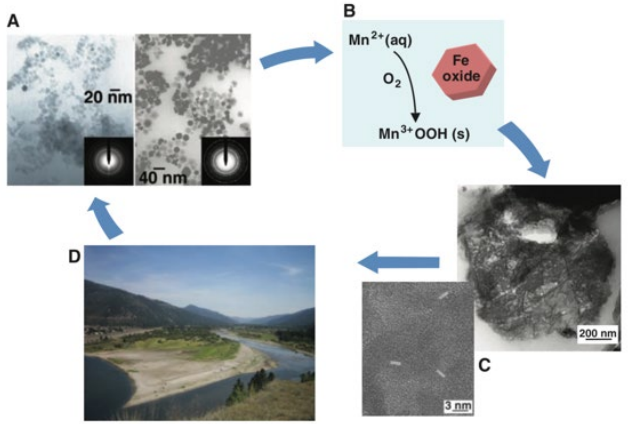
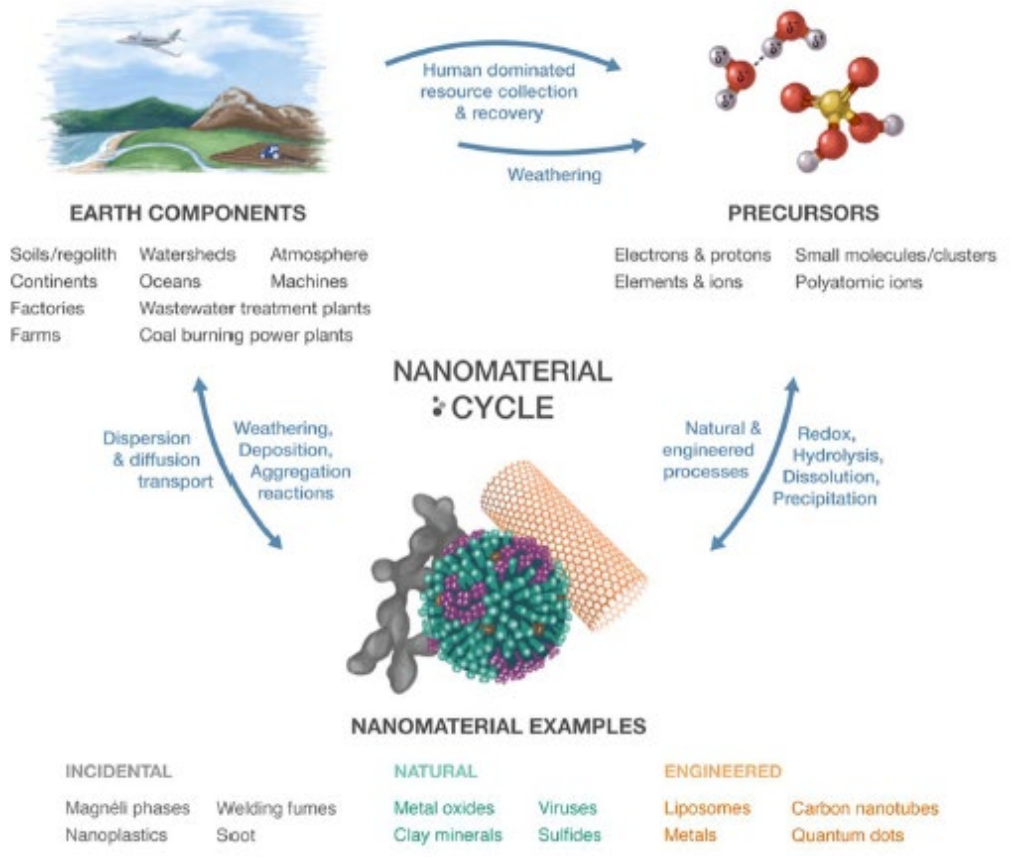
# Research Community for Nano-Earth Systems (nano-ES)

- Nanomaterials are critical components in the Earth system's past, present, and future.
- Natural, incidental, and engineered nanomaterials, regardless of their origin, have unique chemical and physical properties, clearly setting them apart from their macroscopic equivalents and necessitating careful study.






Hochella et al., *Science*, vol. 363, pp. 1414 – 1423, 2019

National Nanotechnology Coordinated Infrastructure

NSF

MONT

NanoEarth

nano@stanford

NCI Southwest

# Research Community for Nano-Earth Systems (nano-ES)

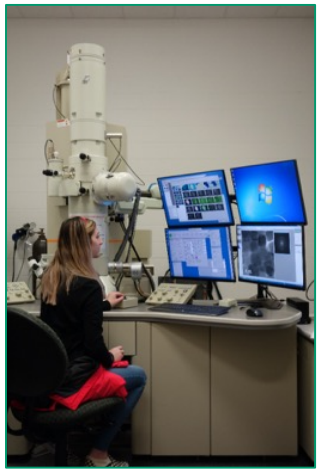
- Building upon the NSF workshop and resulting Science paper, four NNCI sites will lead a Nano Earth Systems research community
- nano-ES bears upon national priorities
  - NNI Signature Initiative – *Water Sustainability through Nanotechnology*
  - NAE Grand Challenge - *Providing Access to Clean Water*
  - NSF 10 Big Ideas – *Growing Convergence Research*



# Research Community for Nano-Earth Systems (nano-ES)

## Goal: Enhance the Earth/environmental capacity and impact of the NNCI

- Develop research tools and infrastructure to provide us with the capacity to approach more complex questions than ever before;
- Train the next generation of researchers to approach scientific inquiry in a way that crosses scales and scientific disciplines;
- Foster collaboration and convergent research across the network and beyond by helping us to consider multiple levels of organization and complexity in addressing key trans-disciplinary questions.



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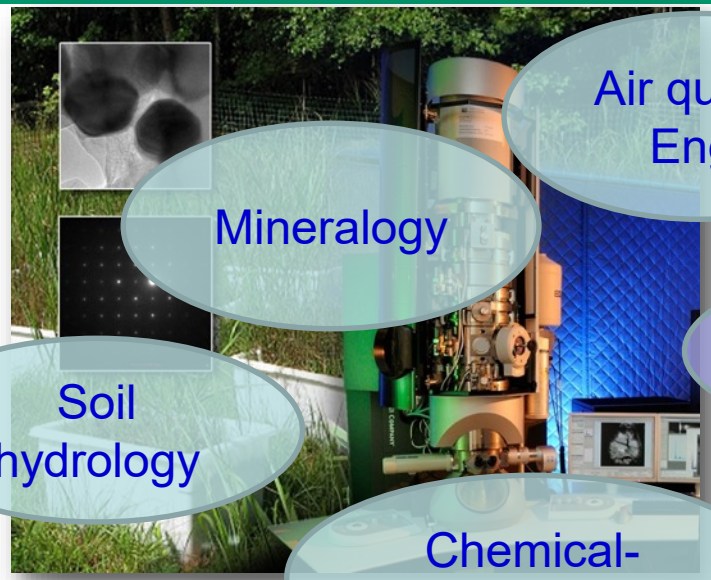
# Research Community for Nano-Earth Systems (nano-ES)



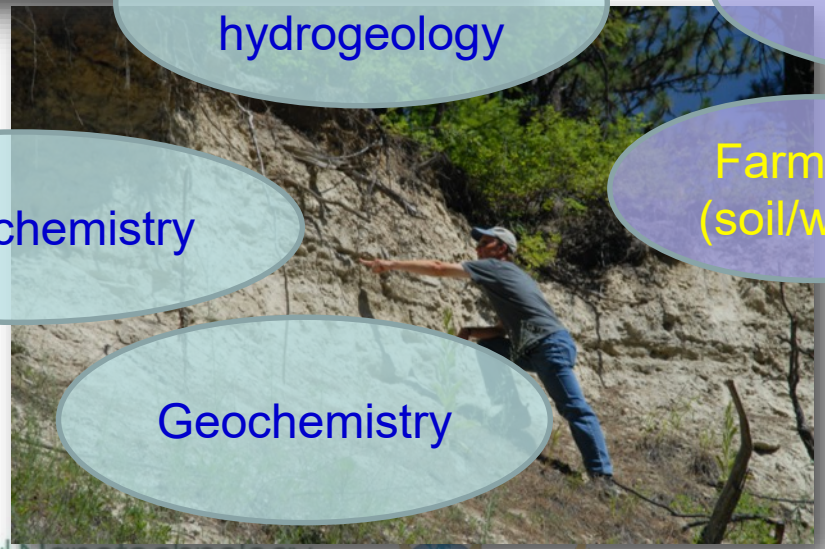
Air quality Eng.

Mineralogy

Soil hydrology

Emerging contaminants

Chemical-hydrogeology

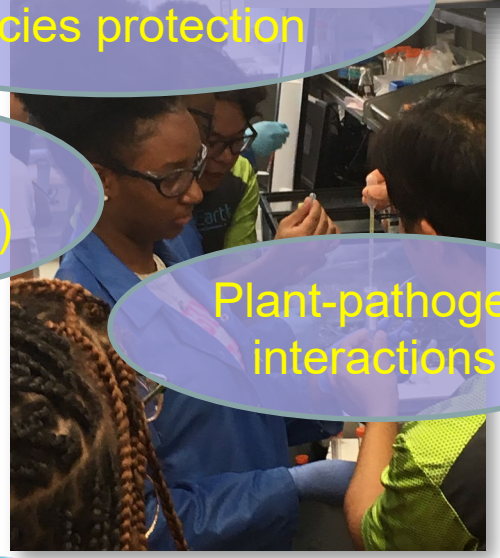


Biogeochemistry

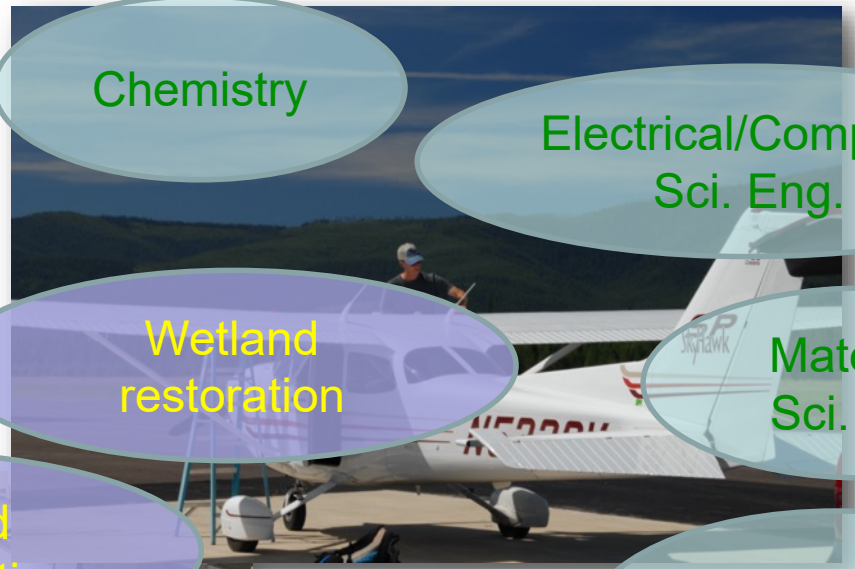
Farmland (soil/water)

Geochemistry

Endangered species protection



Plant-pathogen interactions



Chemistry

Electrical/Computer Sci. Eng.

Wetland restoration

Materials Sci. Eng.

Environmental Sci. Eng.

Civil Eng.

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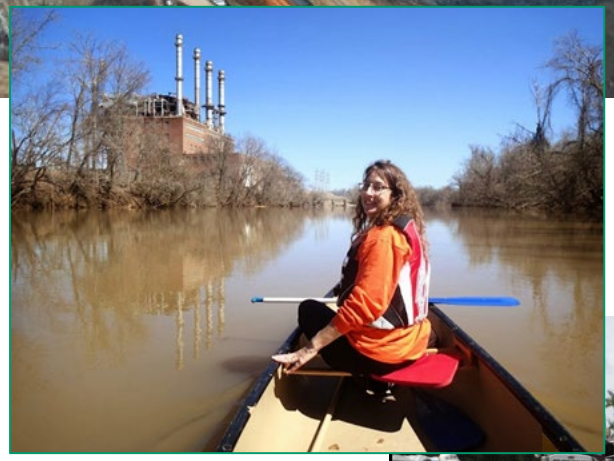
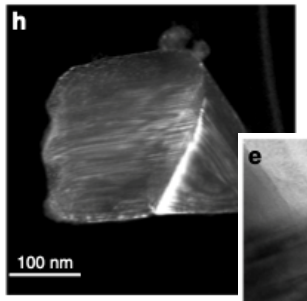
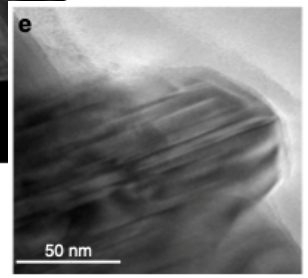
# Find better ways to trace the long-term environmental implications of human activities

Field Sampling → Characterizing → Understanding

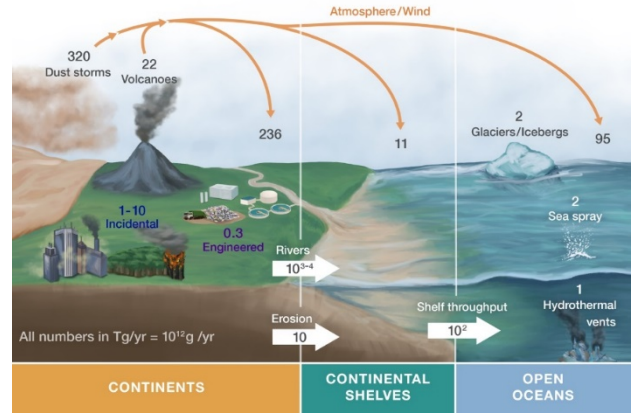





Nanomaterials




TiO2-x




Contaminants

Ge, As,..

Effects of coal ash spills like the one in 2014.02 that fouled 70 miles of the Dan River from Eden, NC, to Kerr Lake in VA…

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# Research Community for Nano-Earth Systems (nano-ES)

The four nano-ES sites will identify, promote, and support research topics of national importance by:

- Organizing annual workshops that bring together local and visiting staff members, hosting-site faculty, students, industrial, non-profit, and governmental nano-ES users, and virtual participants from anywhere
- Staff-exchange between sites to support cross-site awareness and training, new research initiation, and the sharing of best practice across sites
- Connecting REU participants with nano-ES projects from across the four sites

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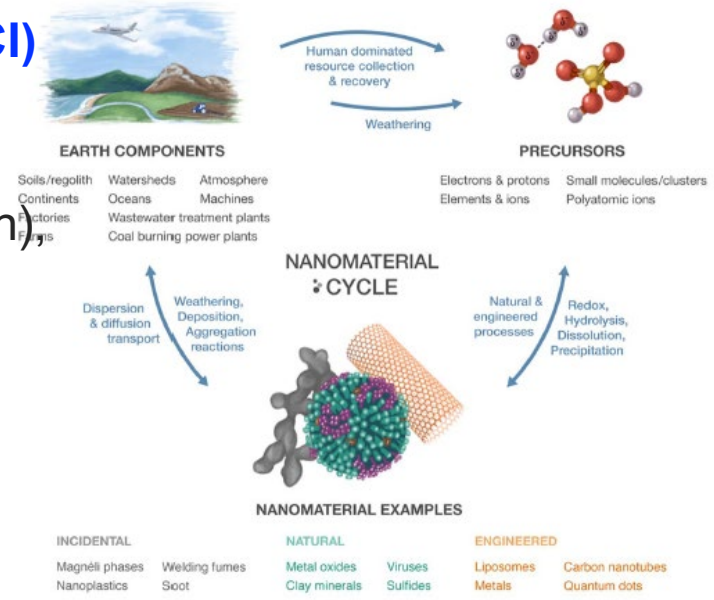
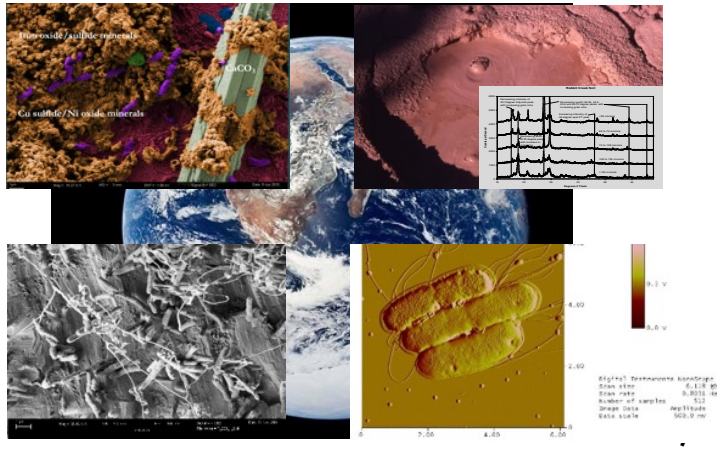
# Research Community for Nano-Earth Systems (nano-ES)

- **Annual workshop** with participants from all nano-ES sites, open registration
  - MONT will host first workshop, Convened virtually in May of 2021 **(Y6 of NNCI)**
  - Dave Mogk (MONT) will chair; virtual meeting hosted by SERC at Carleton College

    Committee: Dave Mogk, Paul Westerhoff (NCI-SW), Tonya Pruitt (NanoEarth), Kate Maher (nano@Stanford), Monica Bruckner (SERC)
- Week-long **staff exchange program (start in Y7)**
  - Staff Exchanges will be delayed due to COVID concerns
- NNCI **Nano-ES Use/Toolset Inventory (Y6)**
  - In Y6 nano-ES will begin assessing NNCI "landscape" for serving users engaged in earth systems science: tools/expertise available, level of usage, gaps; understand unique needs e.g. for preparation of "dirty" samples
- **Joint REU program** with regular NNCI cross-site virtual activities **(start Y6?)**
  - Each of our sites will have at least one Nano ES REU participant
  - Consult with GEO-REU Network run by Val Sloan at the Univ Corporation for Atmospheric Research (UCAR); try to learn "best practices"
  - Facilitate connections for REU faculty in Nano ES
  - Advertise Nano-ES REU across NNCI sites



# Research Community for Nano-Earth Systems (nano-ES)

- Schedule for coming year:

| | |
|---|---|
| August 2020 | first coordination meeting (completed) |
| Fall 2020 | planning for Y6 virtual workshop<br>* Monthly Zoom meetings<br>* Identify invited speakers<br>* Draft workshop agenda<br>* Build website with registration details; live by early 2021 |
| Winter/Spring 2021 | NNCI nano-ES use/needs assessment and REU planning |
| May 2021 | nano-ES RC Workshop (virtual @ MONT/SERC) |
| Summer 2021 | Staff exchange planning |