Cross-border Collaboration and Portfolio Management of Research Infrastructures (RIs):
- Balancing Out Support to Infrastructures of Different Sizes, Serving Different Communities – U.S. Case Study

Science Europe Workshop:

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“The Research Infrastructure Ecosystem”

- Where does one want to play?
  - “Tools”
  - “Locations”
  - “Research”
  - “Cyberinfrastructure”
- “Scale” is driven by stakeholders
  - Local
  - Regional
  - Science Community
  - National/International
- “[Multi]Discipline” is driven by research communities...

Different Programs / Different Scale

- Existing NSF programs are based on (multi)disciplinary needs, as well as scale:
  - “Small”
    - Few remaining discipline-specific instrumentation programs
    - Foundation-wide “Major Research Instrumentation” (MRI) Program
  - “Large”
    - Foundation-wide “Major Research Equipment and Facilities Construction” (MREFC) account
  - “Mid-scale”
    - Very few discipline-specific “in-between-scale” (“mid-scale”) activities
    - No Foundation-wide “mid-scale” activity
The Major Research Instrumentation (MRI) Program

- Acquisition (ACQ) or Development (DEV) of a scientific research instrument
- Maximum request from NSF: $4 million. Minimum request from NSF: $100,000 (with caveats)
- Cost sharing at 20% of total project cost is mandated by U.S. Congress
- Allows for:
  - ACQ: Operations/Maintenance during award period (salary/service contract, etc.)
  - DEV: Salary support for those involved in development, commissioning
- Institutional submission limits (3 max) → 800+ MRI proposals
- Proposals distributed to Divisions based on PI preference
- Institutions determine the mix of disciplines MRI receives
- MRI $$ allocated based on $$ value of proposals being reviewed by a unit
- Funds further parsed based on 1) institution type, 2) size of request

MRI Aspirational Goals

- Provides state-of-the-art research instrumentation up to $4 million
- Develops next generation instrumentation
- Supports research across all NSF Directories
- Catalyzes new knowledge and discoveries
- Empowers the Nation's scientists and engineers
- Enables research-intensive learning environments
- Builds capacity for a diverse workforce
- Develops next generation instrumentation
- Promotes academic/private sector partnerships

Seattle University, a primarily undergraduate institution, credits MRI in part with transformative institutional changes:
• Increased Scholarly Activity
• Active grants from $8 million to $13 million
• Office of Research established
• Creation of NMR & laser labs
• New science building planned

“The Array of Things”, a project supported by MRI and recently announced as part of the White House’s “Smart Cities Initiative”, serves as a tool for researchers to rapidly deploy sensors, embedded systems, computing and communications systems at scale in an urban environment.

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The Major Research Instrumentation (MRI) Program

- A messy flowchart......
Major Research Equipment and Facilities Construction (MREFC)

- Projects representing ~10% of an NSF Directorate’s budget
- Typically $100 million+ depending on Directorate
- Examples:
  - MRI
  - RV Sikuliaq
  - Atacama Large Millimeter/submillimeter Array (ALMA)

Rough Yearly MREFC Budget ~ $225 million
- Covers only Construction. Operations and Maintenance covered from Divisional resources.
- Priorities set by research communities, e.g.,
  - MPS/AST: Astronomy and Astrophysics Decadal Survey (NAS)
  - GEO/AGS: Solar/Heliophysics Decadal Survey (NAS)
  - GEO/AGS, MPS/AST: Planetary Sciences Decadal Survey (NAS)
  - ENG: 14 Grand Challenges for the 21st Century (NAE)
- Currently, proposals received ad hoc when “ready”, little sequencing prioritization
- National Science Board involved in the approval process per the “NSF Large Facilities Manual”....
Major Research Equipment and Facilities Construction (MREFC)

- There is a “gap” at the Foundation-level between MRI and MREFC.
- A few NSF Divisions have programs to “fill the gap”, but little $$.
- Part of the NSF’s “10 Big Ideas” involves “Mid-scale Research Infrastructure”.
- Stay tuned....

Thank You!

Questions: rphelps@nsf.gov

NSF in the U.S. Federal Context

- Who pays?

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<th>Agency</th>
<th>2017 R&amp;D (Billions of Dollars)</th>
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NSF in the U.S. Federal Context

NSF Support of Academic Basic Research in Selected Fields (as a percentage of total federal support)

- Computer Science
- Biology
- Social Sciences
- Mathematics
- Environmental Sciences
- Engineering
- Physical Sciences
- All Science and Engineering Fields