



Office of Research, Graduate Studies  
and Economic Development

University of Missouri

# Cyberinfrastructure

Revolutionary Connections, Global Implications.

# A World Wide Cyber Grid

‘In the same way society now depends on highways, water systems and power grids, scientific research in the coming years will depend on the quality of the **cyberinfrastructure** – the integrated information, computing and communications systems that tie us together.’

— National Science Foundation



...for  
research  
that spans  
the globe.

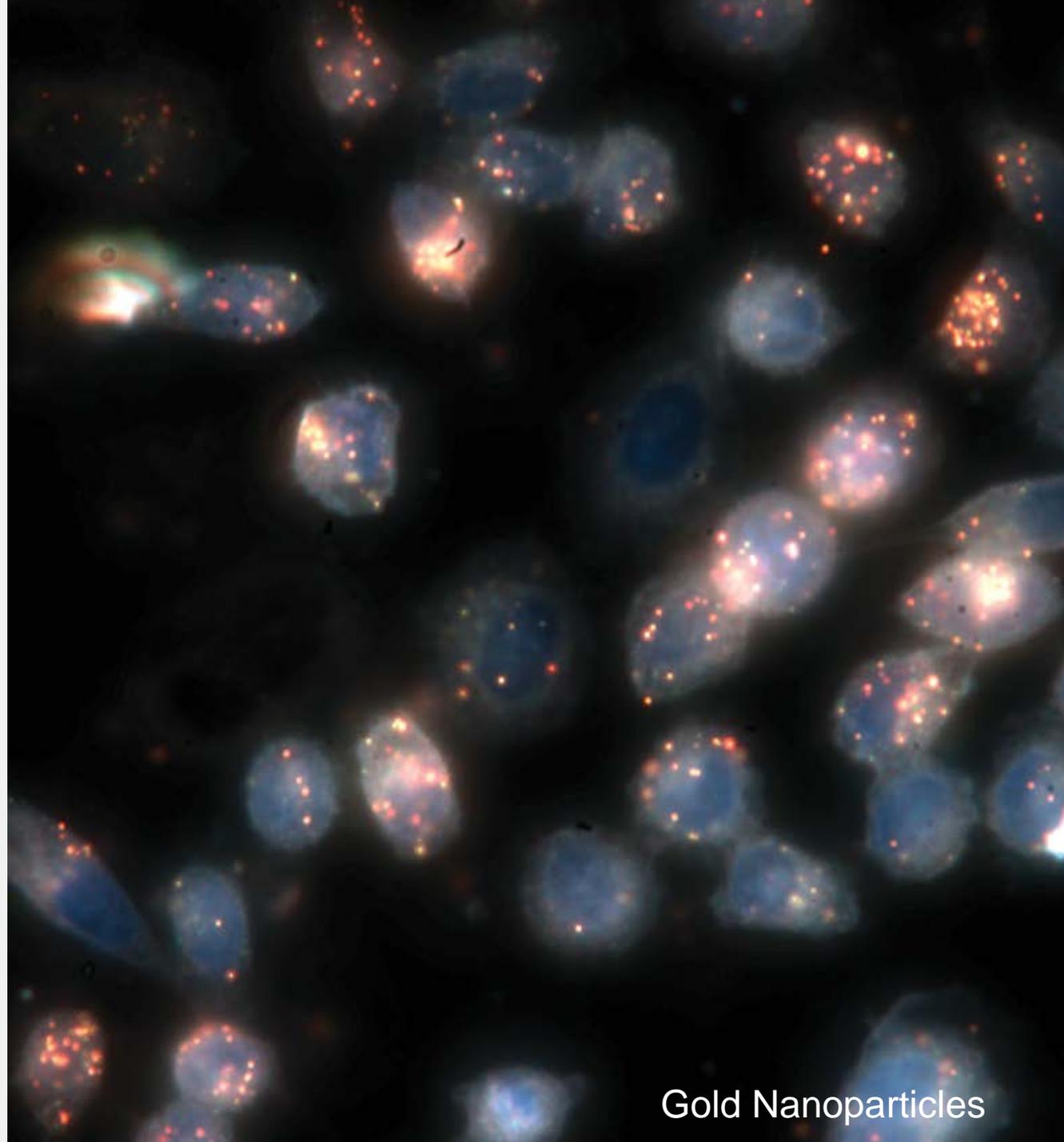


**MU graduate student and Life Sciences Fellow Stephanie Schuttler in Gabon's Lopé National Park, 2011.**



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**Vision:** To provide  
and support the  
cyberinfrastructure  
necessary to excel  
in the discovery,  
dissemination and  
application of  
knowledge.

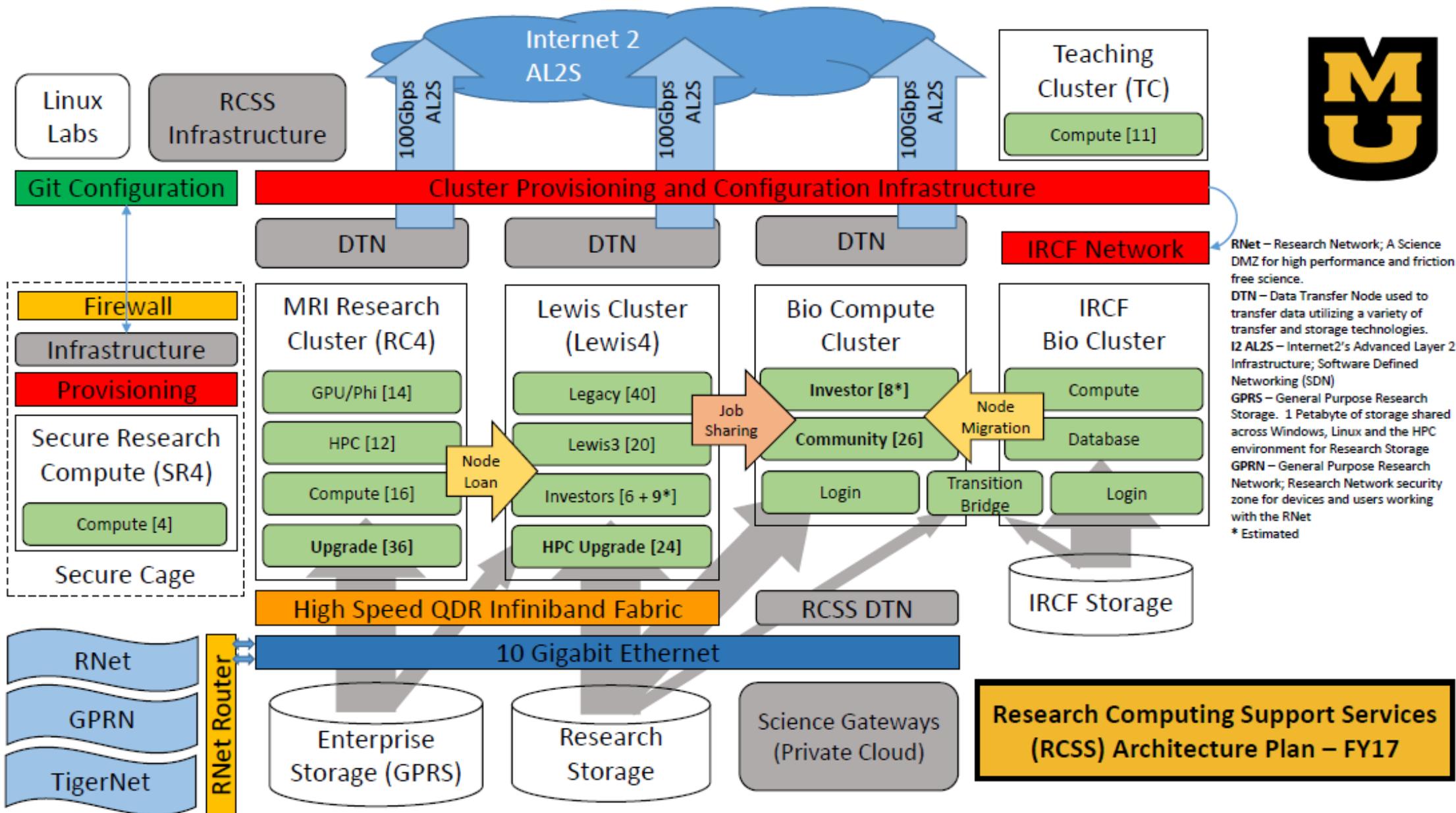


Gold Nanoparticles



# CI Defined

Cyberinfrastructure is made up of environments supporting the **acquisition, storage, management, integration, mining, and visualization of data**. It also includes **interconnecting data networks** and other computing and information processing services. CI depends upon **human** as well as **technology** resources.



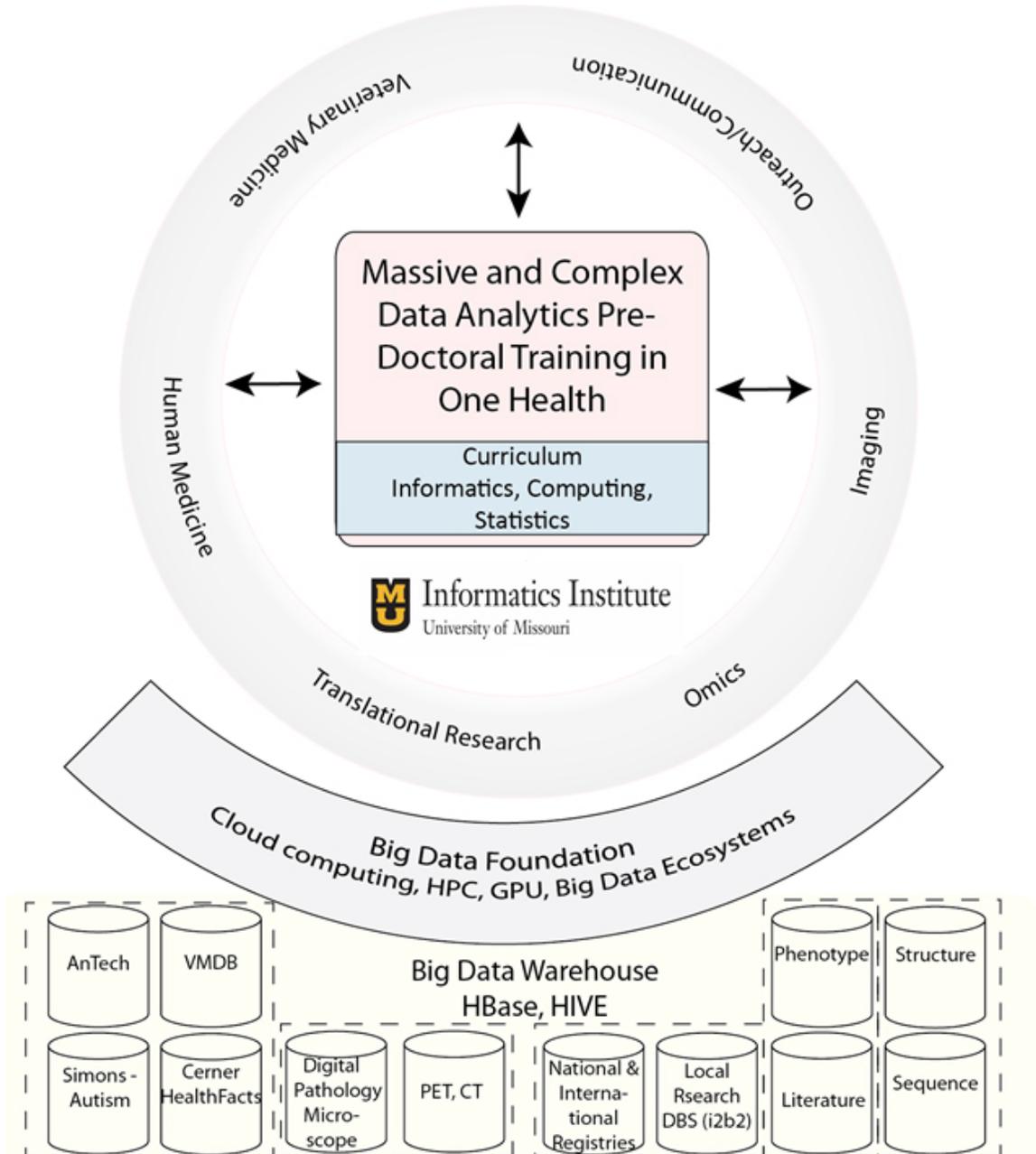


# Who Needs Enhanced CI ?

Not just researchers in science and engineering. Scholars in the **humanities and social sciences** will benefit from local and remote **access to large data sets, instruments, and archives.**

Students Will Also See Gains: In particular, **graduate students** will use and benefit from enhanced CI, as will **undergraduate students who participate in research.**

Any Others Who Will Benefit?





## Big Data Sciences Pre-Doctoral Training funded by NIH T32

- Bioinformatics, Data Mining, and Machine Learning Lab
- Data Science Lab
- Digital Biology Lab
- Interdisciplinary Data Analytics and Search Lab
- RNA Computational Biology Lab
- Translational & Cancer Bioinformatics Lab
- Virtualization, Multimedia, and Networking Lab
- Vision-Guided and Intelligent Robotics Lab
- Computational Genomics Lab

# Principles for Planning

Data are an important asset and must be protected and preserved. The university should **provide appropriate data dissemination, data security, and data preservation and curation services** for researchers.

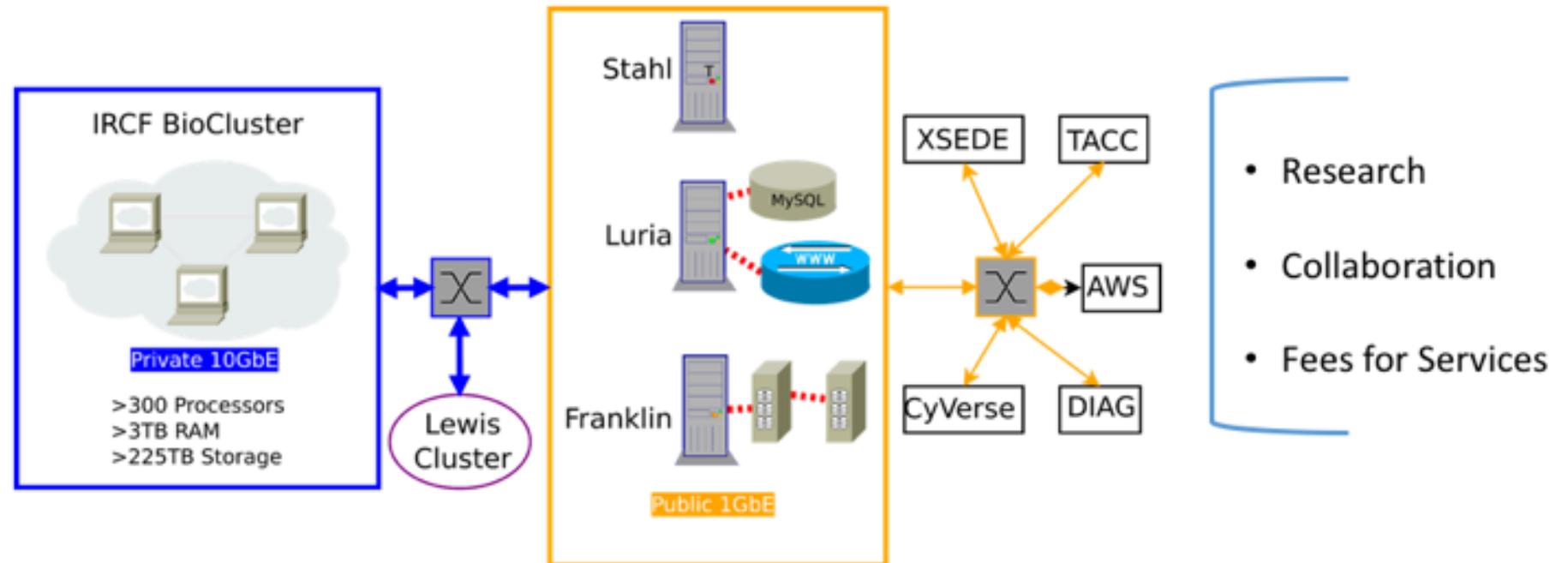
# Principles for Planning (2)



Resource allocations should be based on the **common good**, with benefits for many. An architecture that **supports integration and is extensible** should be designed and followed.

# Principles for Planning (3)

CI users need to help prioritize purchase decisions and ensure **good stewardship** of limited funding and resources. Faculty should also consider **resources available beyond campus**.





## Principles for Planning (4)

Make CI **sustainable**: This will require **university funding, student fees, and external project funding**. Researchers should work with program officers and funding agencies to budget for and include **CI services as a direct cost**.

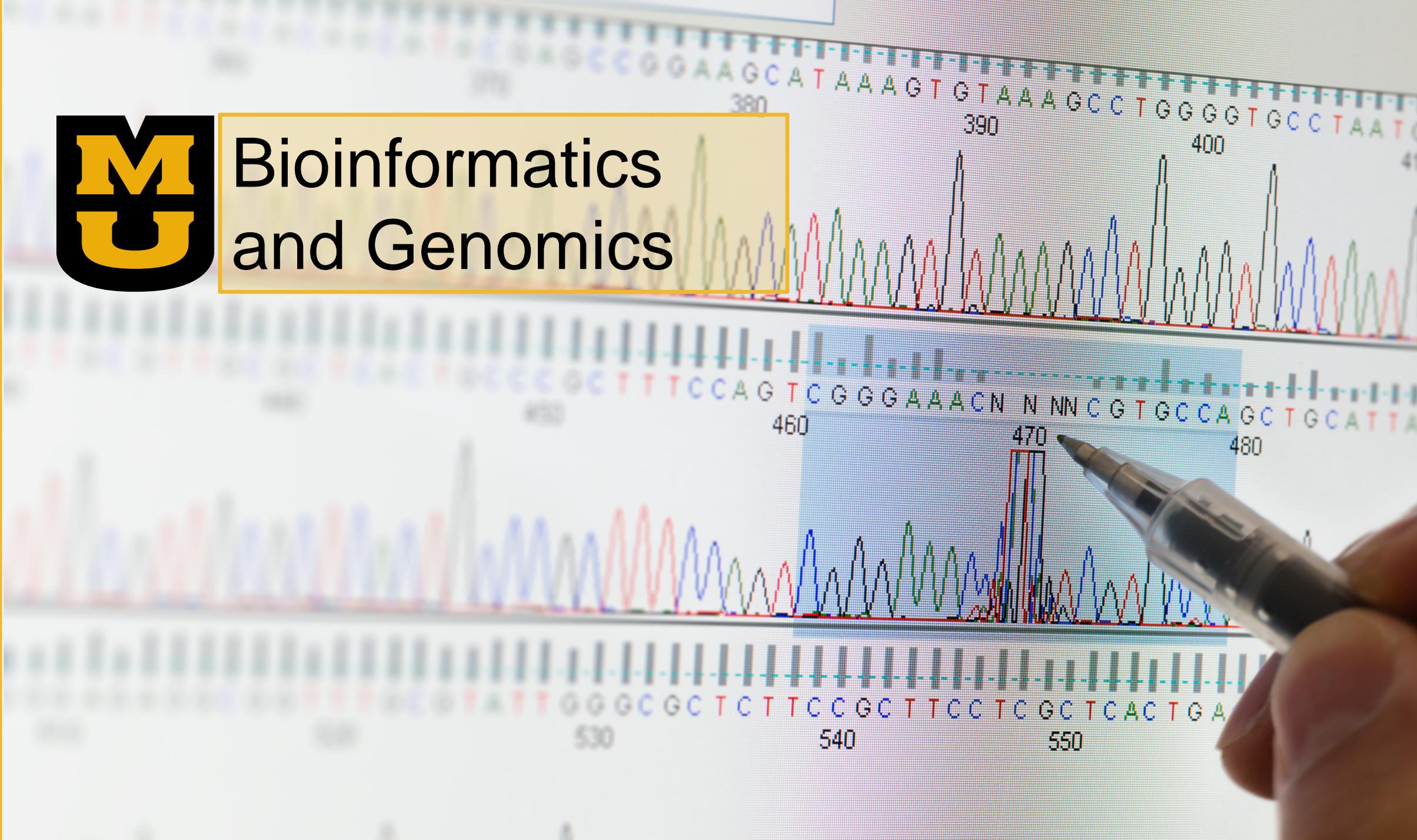


# One Vision, Four Focus Areas

- 
1. Bioinformatics and Genomics
  2. Geospatial Sciences
  3. Digital Humanities
  4. Imaging And Visualization



# Bioinformatics and Genomics



# At MU's Core Facilities, Shared CI Resources Yield Collaborative Advances

MU's DNA Core facility is just one example of how MU researchers can leverage shared resources to do more.



MU's DNA Core uses NextSeq 500 and two MiSeq instruments, as well as ancillary equipment.

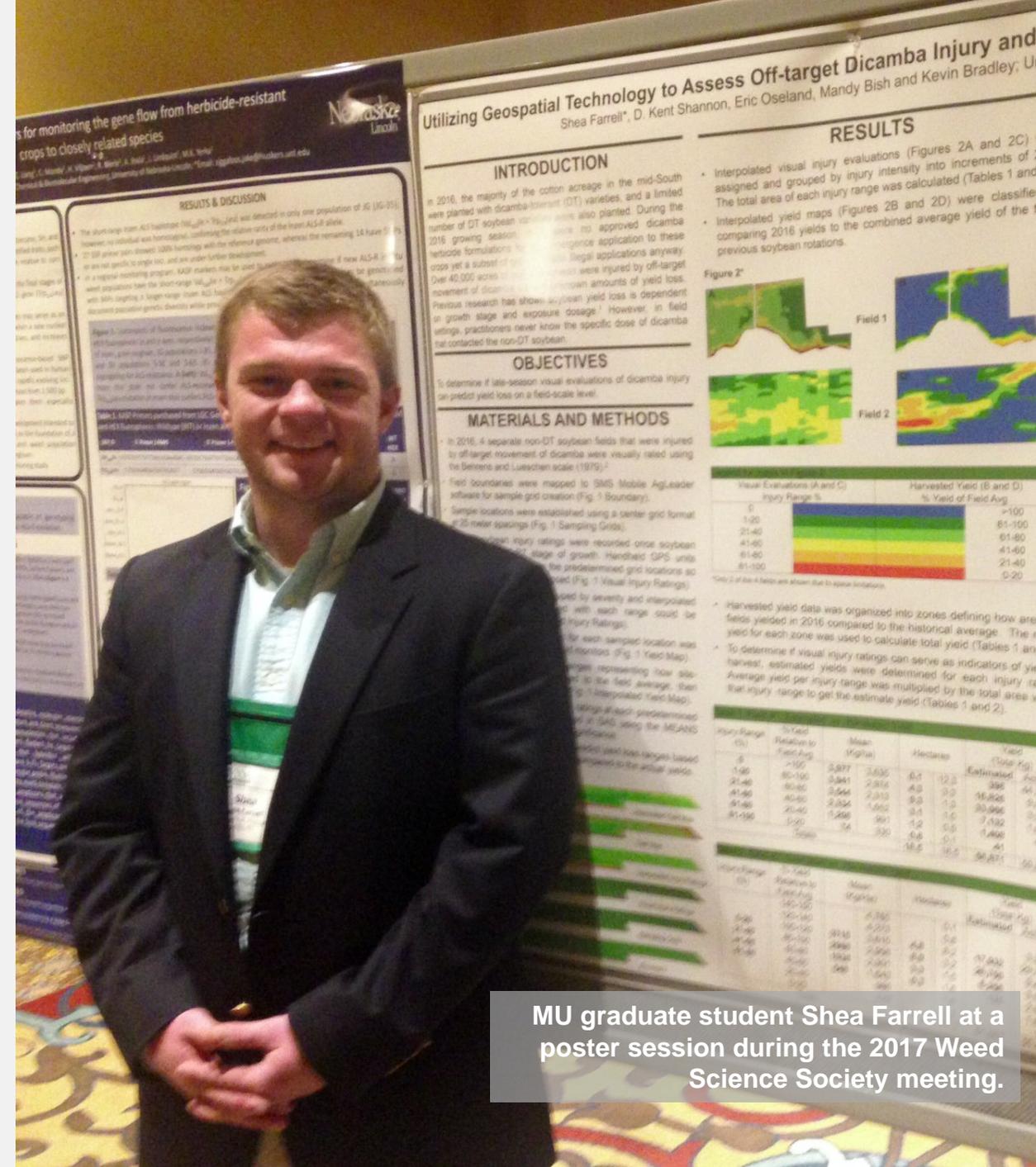


# Geospatial Sciences



# MU: An emerging leader in data science and analytics

Mizzou faculty and students are poised to join the world's leading geospatial and location-driven data scientists in developing cutting-edge applications of geospatial data strategies including geospatial Big Data, GIS, geostatistical analysis and remote sensing.



MU graduate student Shea Farrell at a poster session during the 2017 Weed Science Society meeting.

## ... And a Hub for Geospatial Intelligence

MU's **Center for Geospatial Intelligence** partnered with the Harris Corporation to provide advanced geospatial products and services to meet NGA's needs under its five-year Foundation GEOINT Content Management (FGCM) program.

With the **MU Informatics Institute**, CGI was awarded a five-year, **\$12 million contract to deliver a data science education program** that will provide analytical training for the NGA workforce and potentially other members of the U.S. Intelligence Community



# Digital Humanities



Peeter Neefs the Elder.  
*Interior of a Gothic Church*  
(ca. 1620). Collection of the MU  
Museum of Art and Archaeology

## Digital Collections, Worldwide Access

MU's **Museum of Art and Archaeology** used a grant from the federal Institute for Museum and Library Services to digitalize its entire collection...

Thomas Hart Benton  
Portrait of a Musician, 1949



... as a searchable database that scholars, faculty, students and anyone needing access can use. “It brings over **6,000 years of art history** to your fingertips.”



**Bowl Depicting a Killer Whale**  
Nazca, ca. 200-600 CE  
Peru



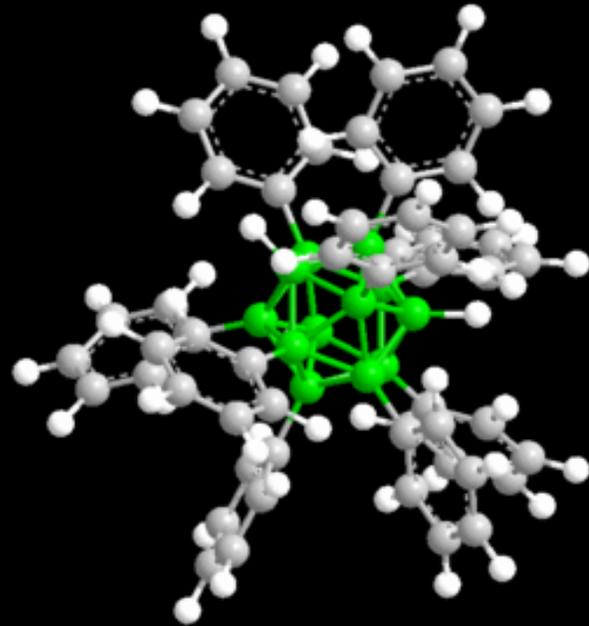
# Imaging and Visualization



A genome structure with chromosome in different colors.  
Tuan Trieu Jianlin Cheng: *Nucleic Acids Research*  
17 February 2017

# Modeling the Unseeable

Mark Lee, a chemist with MU's College of Arts and Science, has created images of a new class of hybrid nanomolecules. His discovery could lead to lower cost solar-energy cells.



3D rendering of a polyarylboration from MU's Mark Lee



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