Accelerating Toward the Singularity

Invited Presentation
Singularity University Formation Meeting
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Three Accelerators for an Exponentially Data Rich World

- **Supercomputers Surpassing Human Brain Speed**
- **Scalable Visualization of Large Scale Images**
- **Personal Lightpaths Enable Global Collaboratories**

All Are Transformational for Singularity University

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First Sustained PetaFLOP Supercomputer

- **NSF's IBM Blue Waters at NCSA**
  - On-Line 2011
  - 200,000 Processor Cores
  - 1 PetaByte Memory
  - 10 PetaBytes of Rotating Storage
  - ¼ of UIUC Electricity



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Fastest Computer on Earth will Reach ~ Human Brain Speed 100 PetaFLOPS by 2016

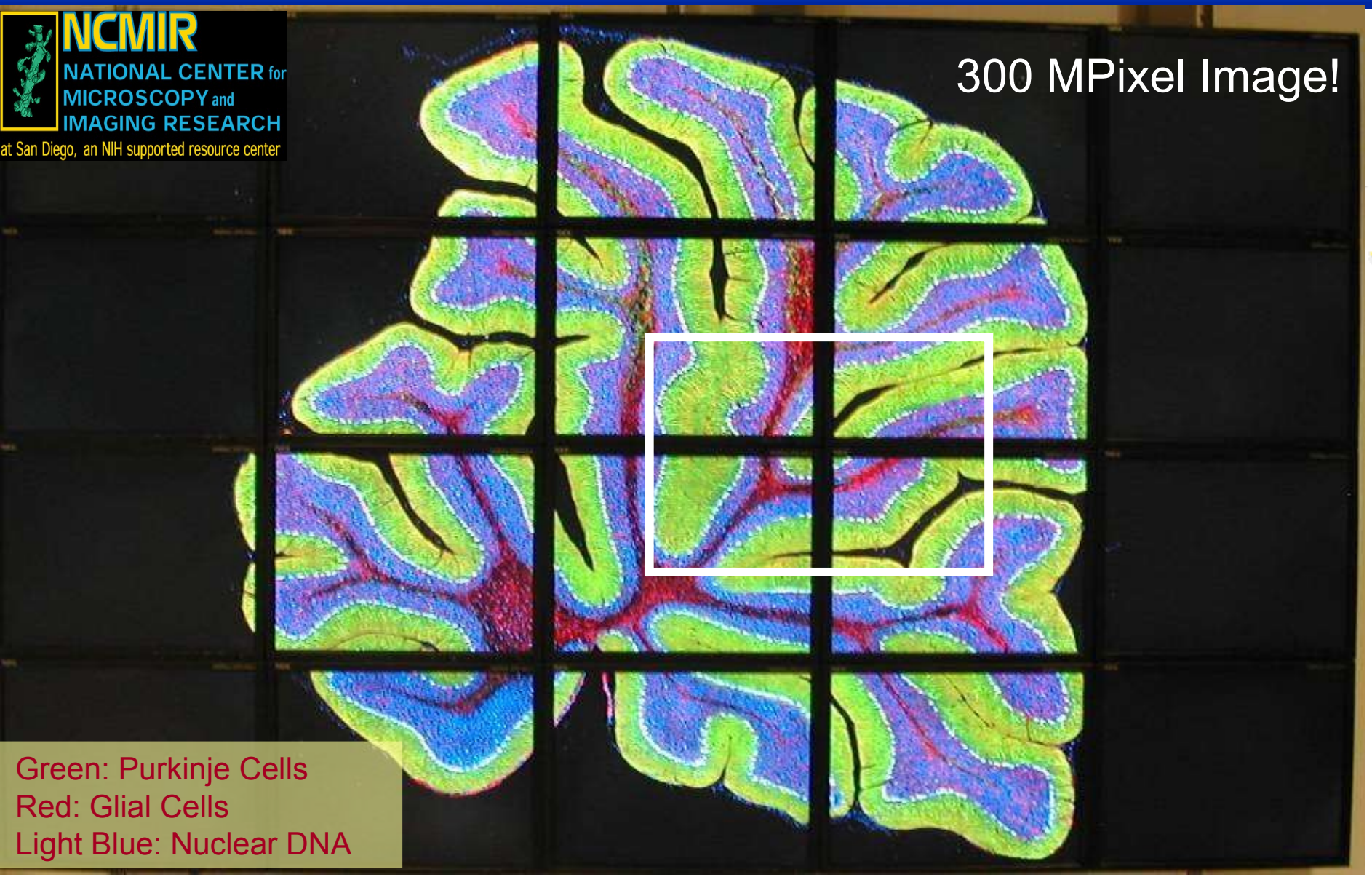
- Requires Megacomputers~One Million Cores
- Runs ~ One Million Times Hotter than Brain



www.top500.org/lists/2008/06/performance_development

Accelerator: Visualize Vast Data Sets Using Scalable Commodity Systems

NCMIR
NATIONAL CENTER for MICROSCOPY and IMAGING RESEARCH
at San Diego, an NIH supported resource center



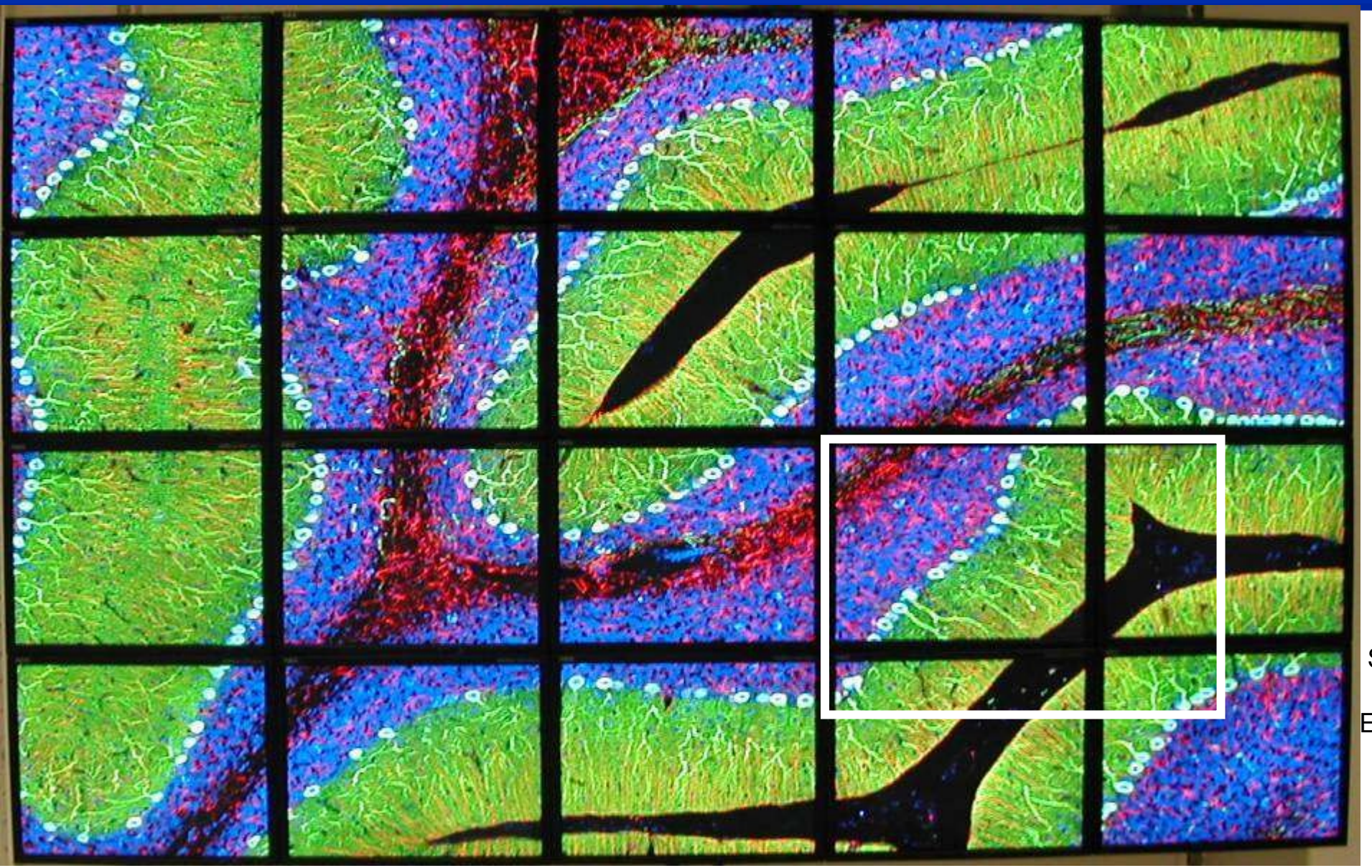
Green: Purkinje Cells
Red: Glial Cells
Light Blue: Nuclear DNA

Source: Mark Ellisman, David Lee, Jason Leigh

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OptIPuter

Scalable Displays Allow Both Global Content and Fine Detail



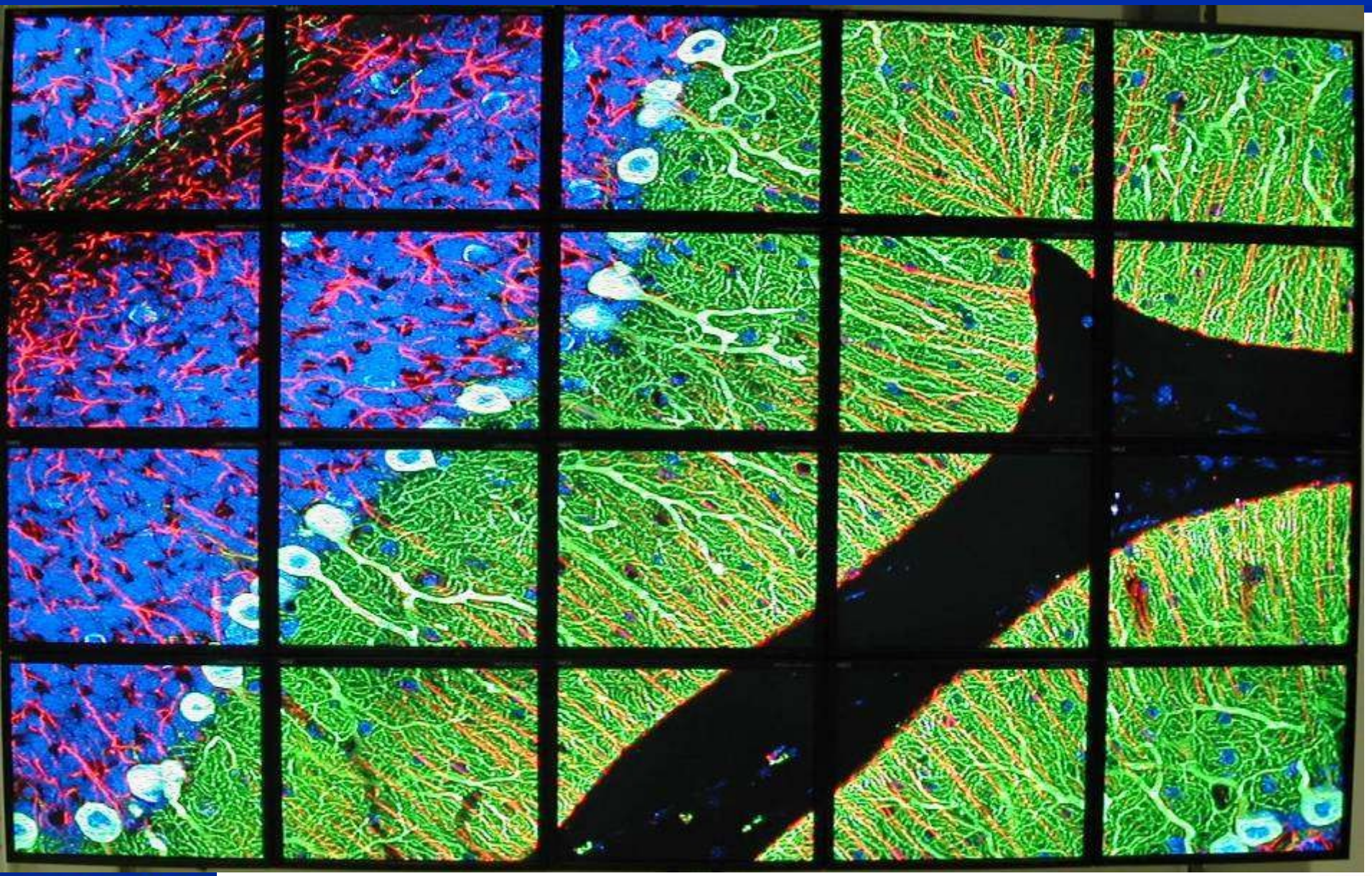
Source: Mark Ellisman, David Lee, Jason Leigh

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30 MPixel SunScreen Display Driven by a 20-node Sun Opteron Visualization Cluster

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Allows for Interactive Zooming from Cerebellum to Individual Neurons

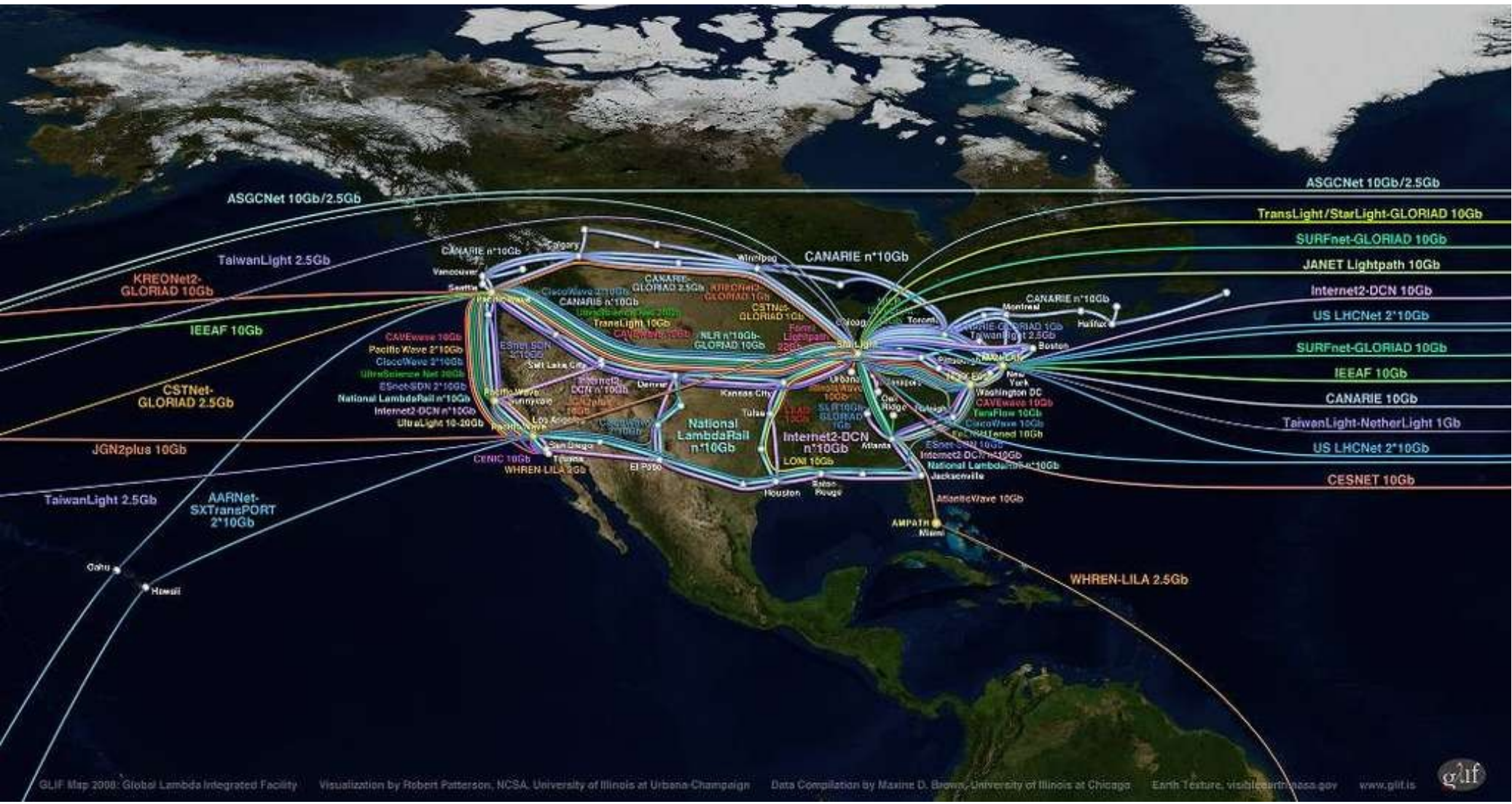


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Source: Mark Ellisman, David Lee, Jason Leigh

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Global Innovation Centers are Being Connected with 10,000 Megabits/sec Clear Channel Lightpaths



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Research on 100 Gbps and 1 Tbps

Source: Maxine Brown, UIC and Robert Patterson, NCSA

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Optical Fiber Telepresence Will Accelerate Rate of Global Discovery



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Ultra Resolution Virtual Reality: 3D Global Collaboratory

