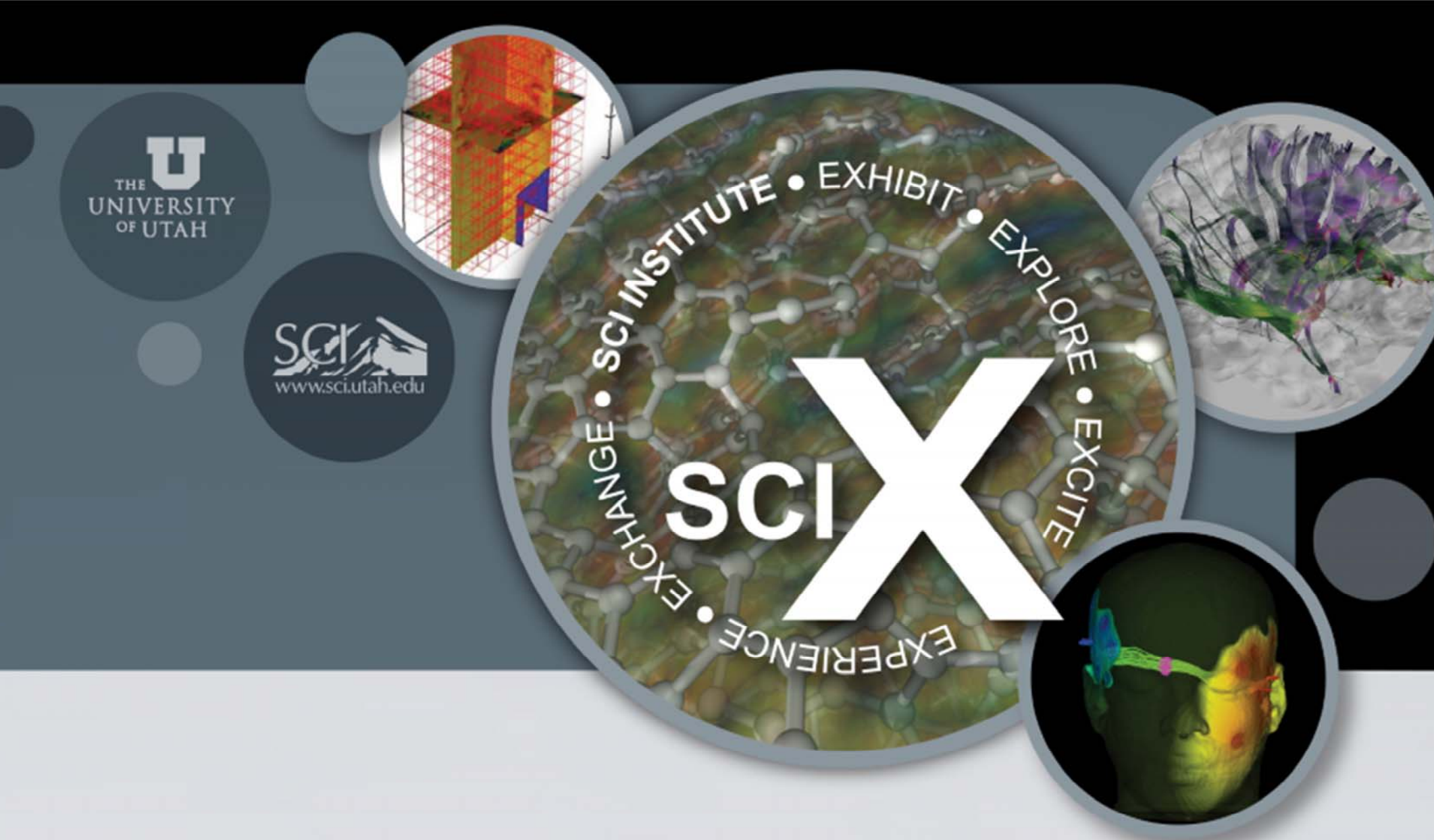# Data Acquisition, Management and Computation for Neuroscience

Aniketh Venkat[1], Frederick Federer[2], Steve Petruzza[1], Attila Gyulassy[1], Alessandra Angelucci[2] and Valerio Pascucci[1]
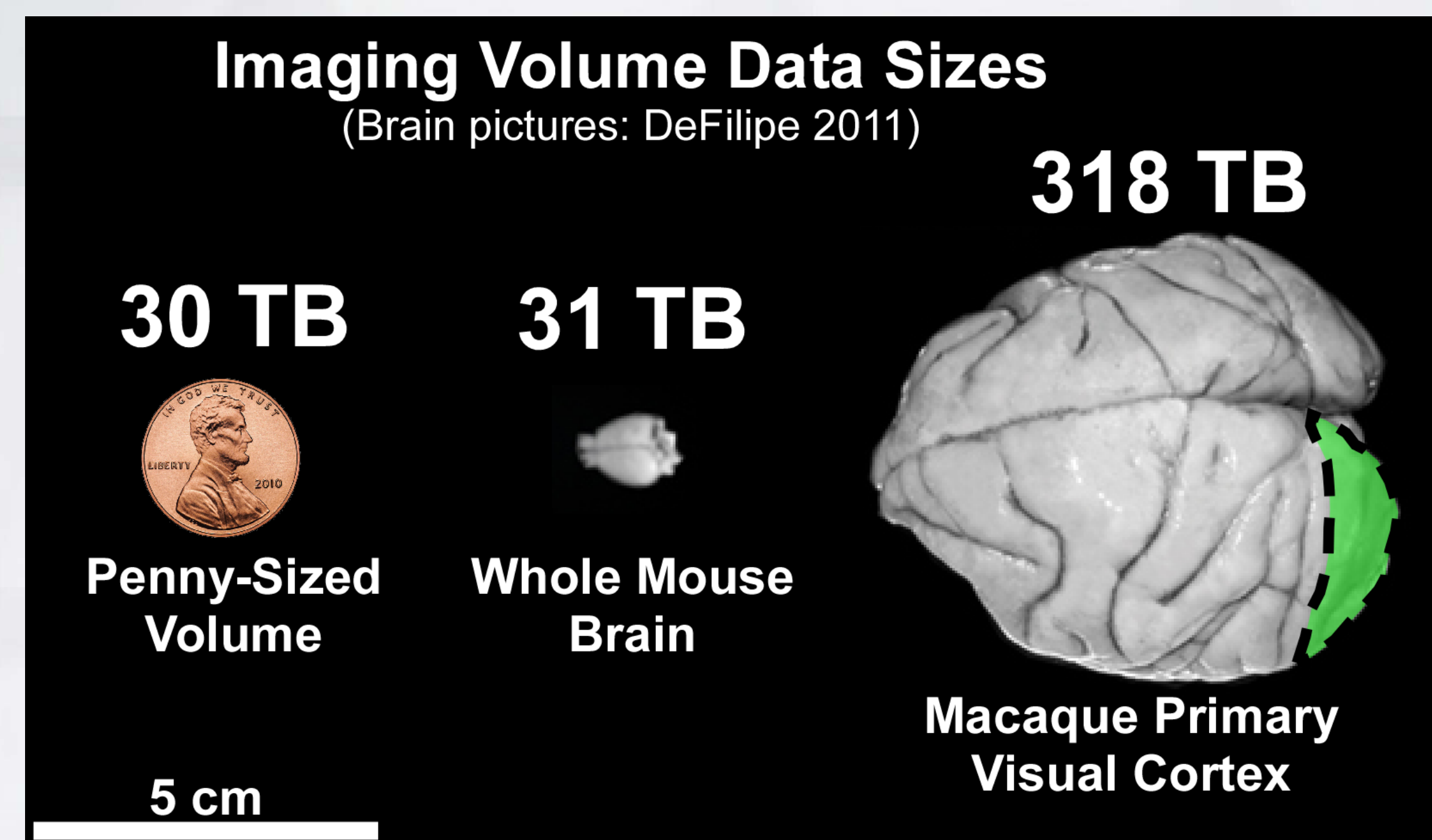
[1] Scientific Computing and Imaging Institute   [2] Department of Ophthalmology and Visual Science, Moran Eye Center, University of Utah
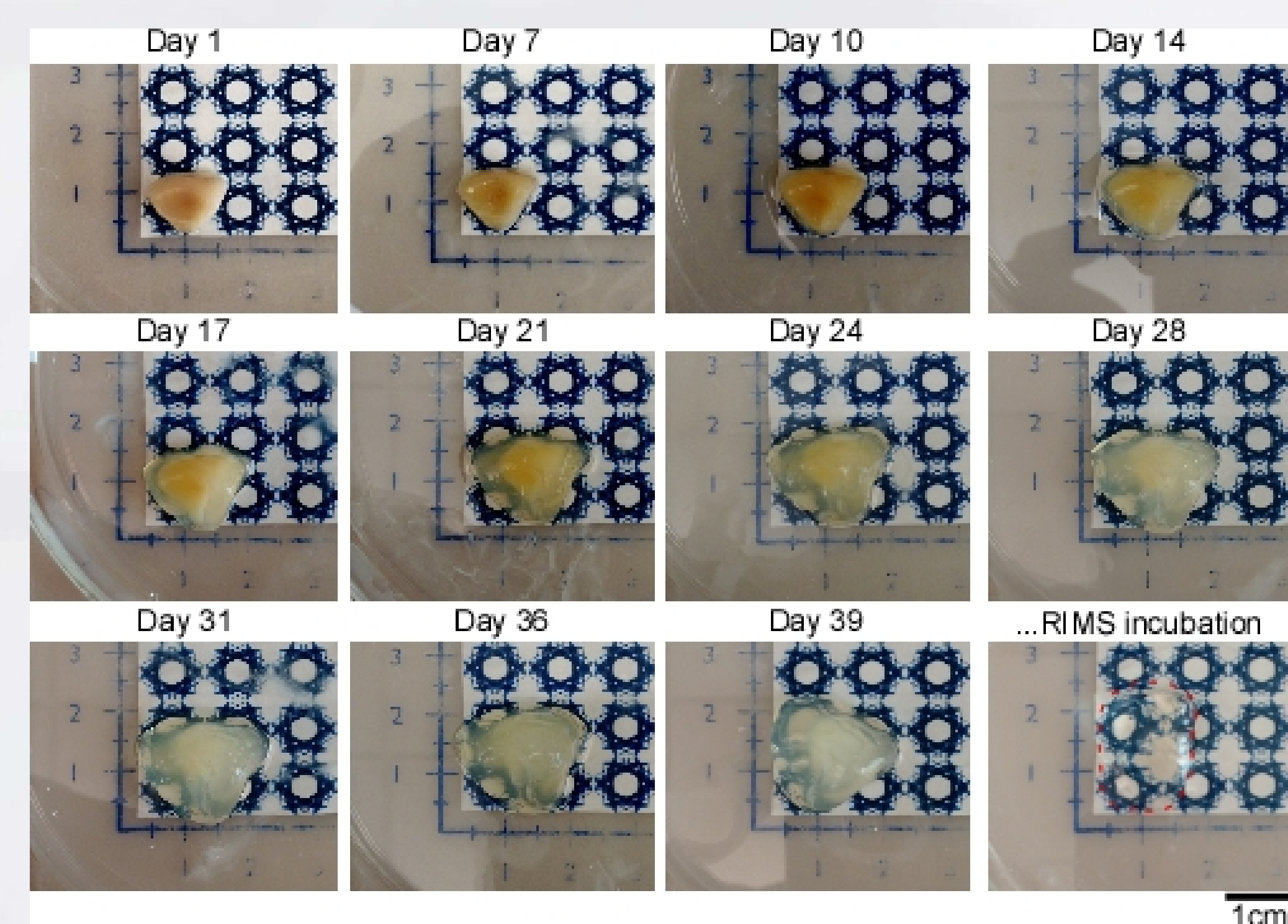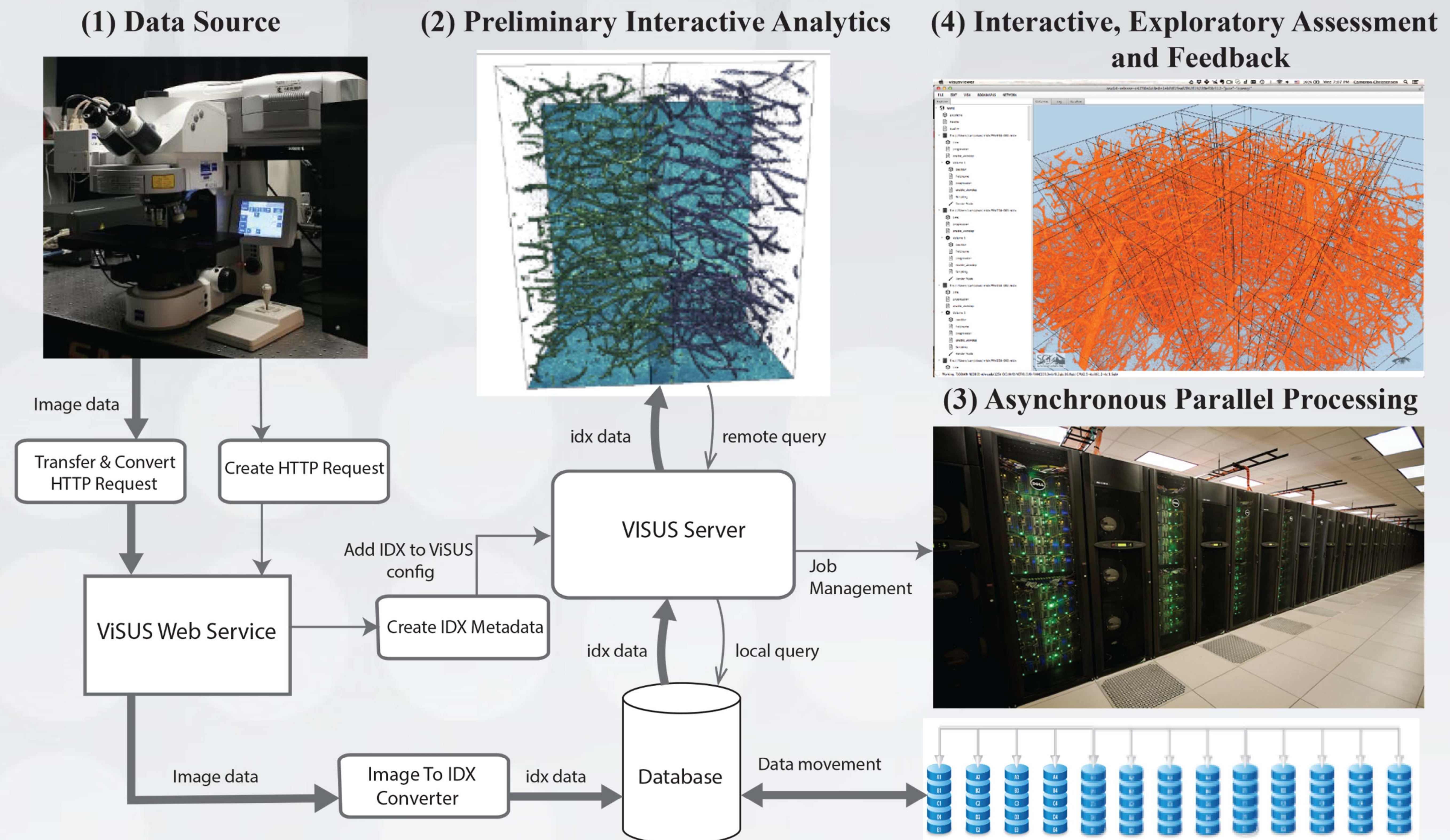
Overview

- Brain functions emerge from the coordinated activity of billions of neurons connected in specific ways to form highly dense neural circuits.
- Understanding human brain function and how neurological and psychiatric diseases affect the brain are just a few fields that would immensely benefit from primate brain maps.
- Obtaining primate brain maps using viral-vector mediated high-resolution fluorescent labeling results in several terabytes of raw image data.
- A scalable cyber infrastructure that converts the data into visualization format during acquisition for real-time exploration and analysis is the key to accelerate progress towards generating mesoscopic scale connectomes.

Imaging Volume Data Sizes
(Brain pictures: DeFilipe 2011)

30 TB — Penny-Sized Volume
31 TB — Whole Mouse Brain
318 TB — Macaque Primary Visual Cortex

5 cm

Clearing the Brain: CLARITY

Day 1, Day 7, Day 10, Day 14, Day 17, Day 21, Day 24, Day 28, Day 31, Day 36, Day 39, ...RIMS incubation

1cm

The ViSUS Visualization Framework

(1) Data Source

(2) Preliminary Interactive Analytics

(4) Interactive, Exploratory Assessment and Feedback

(3) Asynchronous Parallel Processing

Image data → Transfer & Convert HTTP Request
Create HTTP Request
ViSUS Web Service → Add IDX to ViSUS config → Create IDX Metadata
VISUS Server
idx data / remote query
idx data / local query
Job Management
Image data → Image To IDX Converter → idx data → Database
Data movement

Remote Monitoring of Data Quality During Acquisition