

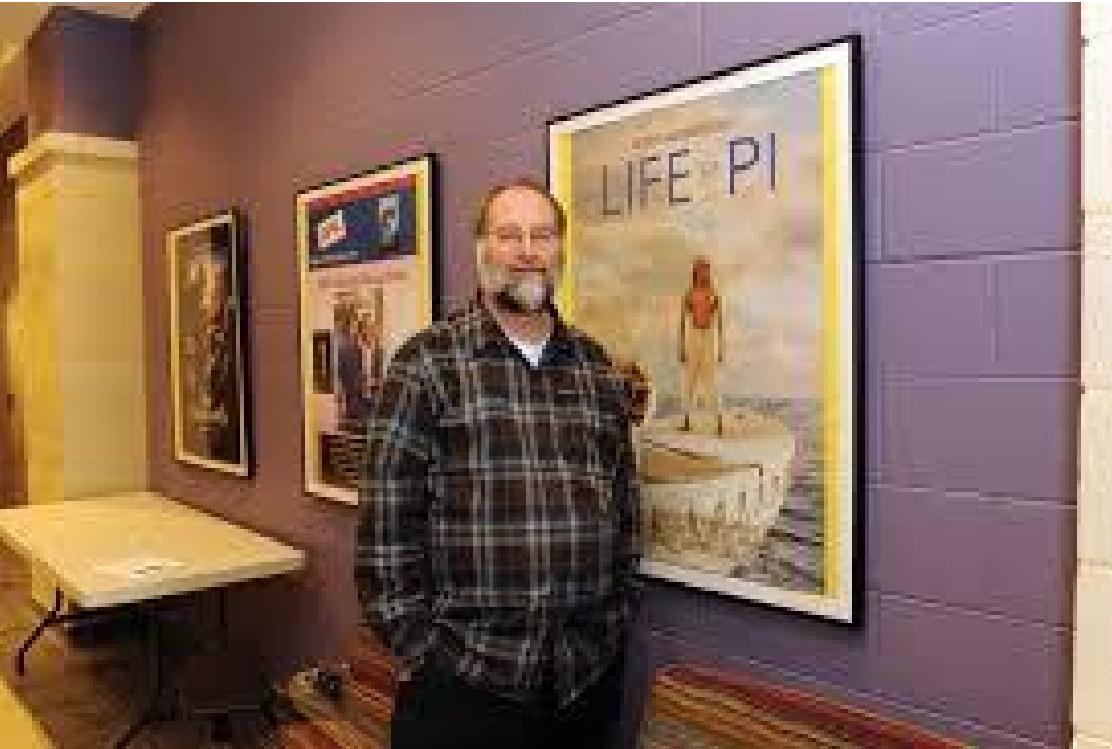


Jerry Tessendorf

School of Computing

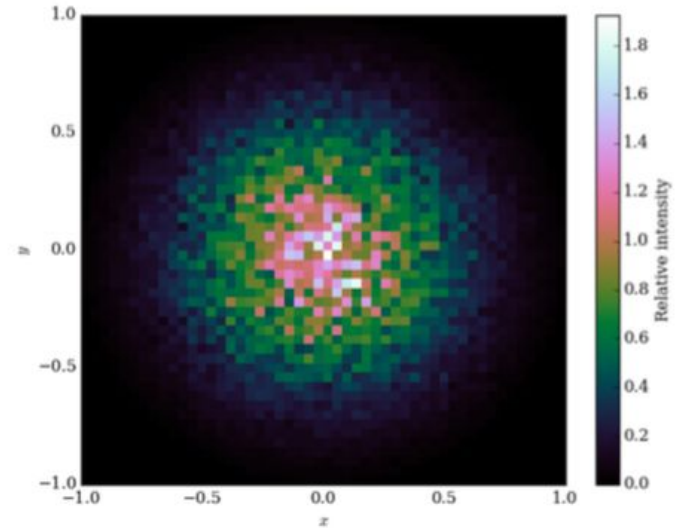
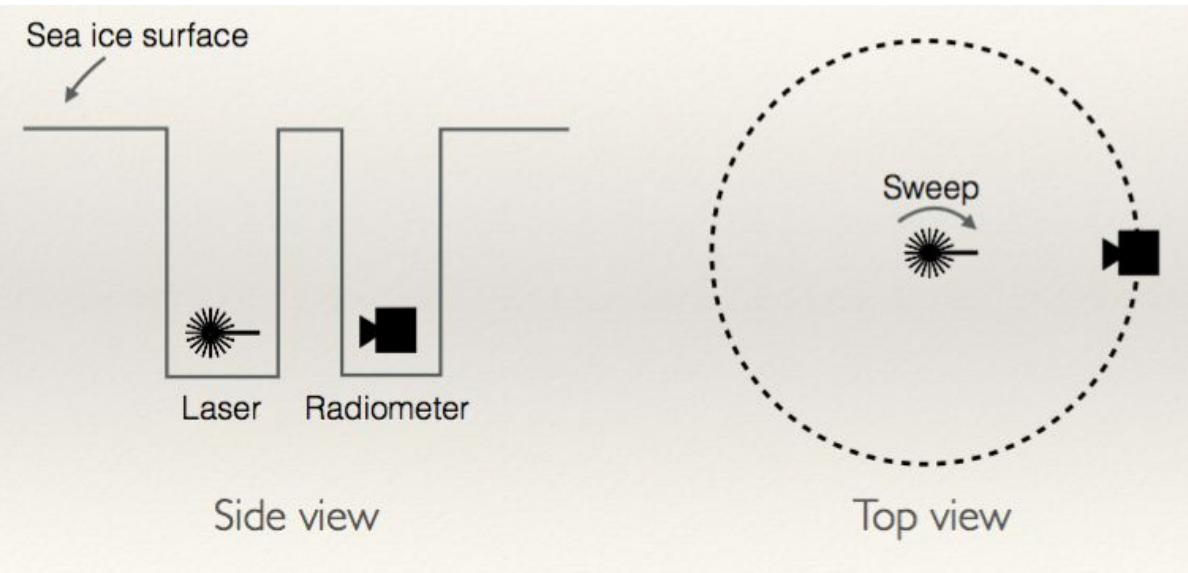
To Jonathan Cohen, Dr. Jerry Tessendorf, Dr. Jeroen Molemaker and Michael Kowalski for the development of the system of fluid dynamics tools at Rhythm and Hues. This system allows artists to create realistic animation of liquids and gases, using novel simulation techniques for accuracy and speed, as well as a unique scripting language for working with volumetric data.

Radiative Transfer from a Monte Carlo Evaluation

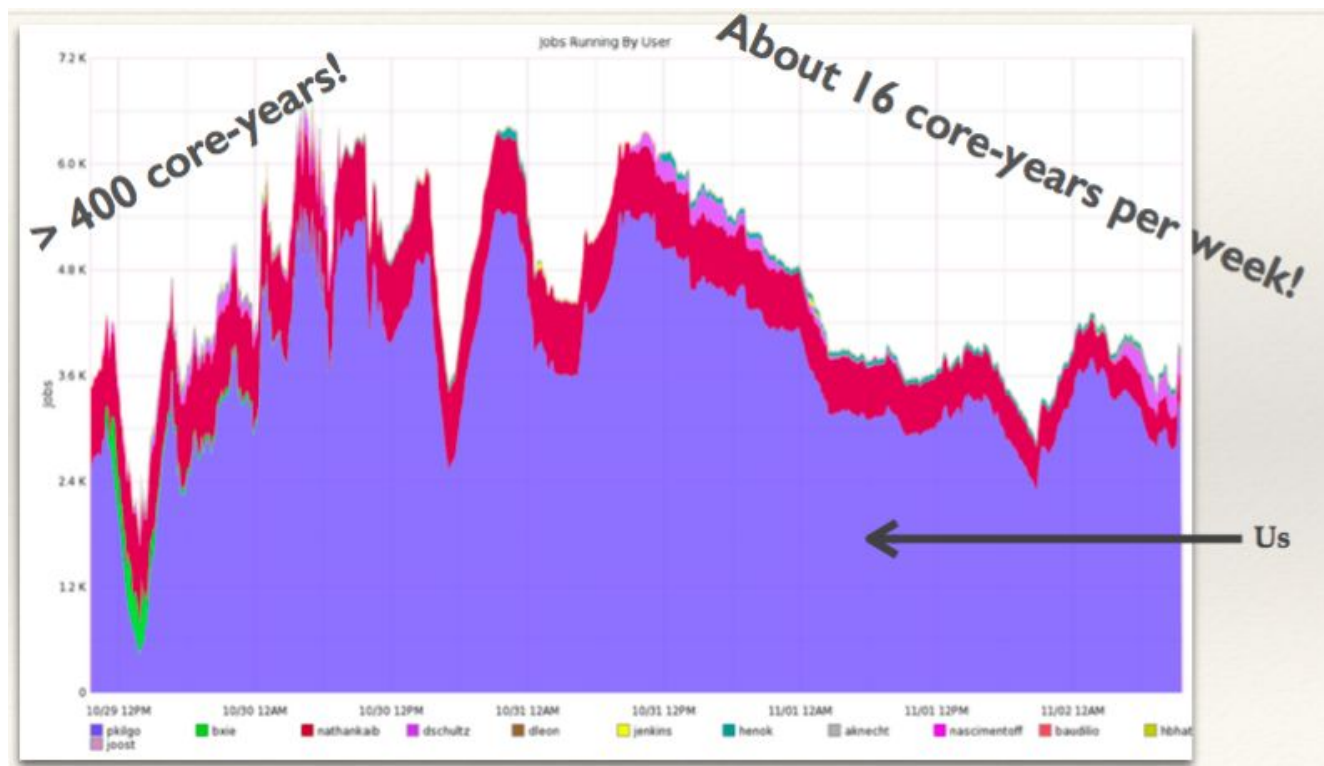


- Astrophysics
- Nuclear engineering
- Medical imaging & Diagnosis
- Communications
- Remote sensing
- Sensor design
- Computer graphics

- Efficient random path perturbation that satisfies boundary conditions & constraints.
- Generates 1000's of paths from an initial path.
- Rate: ~60,000 paths/min on one core
- To compute the radiance, a total of $O(10^9)$ paths needed for convergence.



- Single experiment takes 80 compute years!
- An embarrassingly parallel problem
- Can take advantage of high throughput computing and GPU computation





Alex Feltus

Genomics



<http://cdn.phys.org/newman/csz/news/800/2015/cansorghumcr.jpg>

Drought



<http://ww3.hdnux.com/photos/23/43/67/5127618/3/rawImage.jpg>



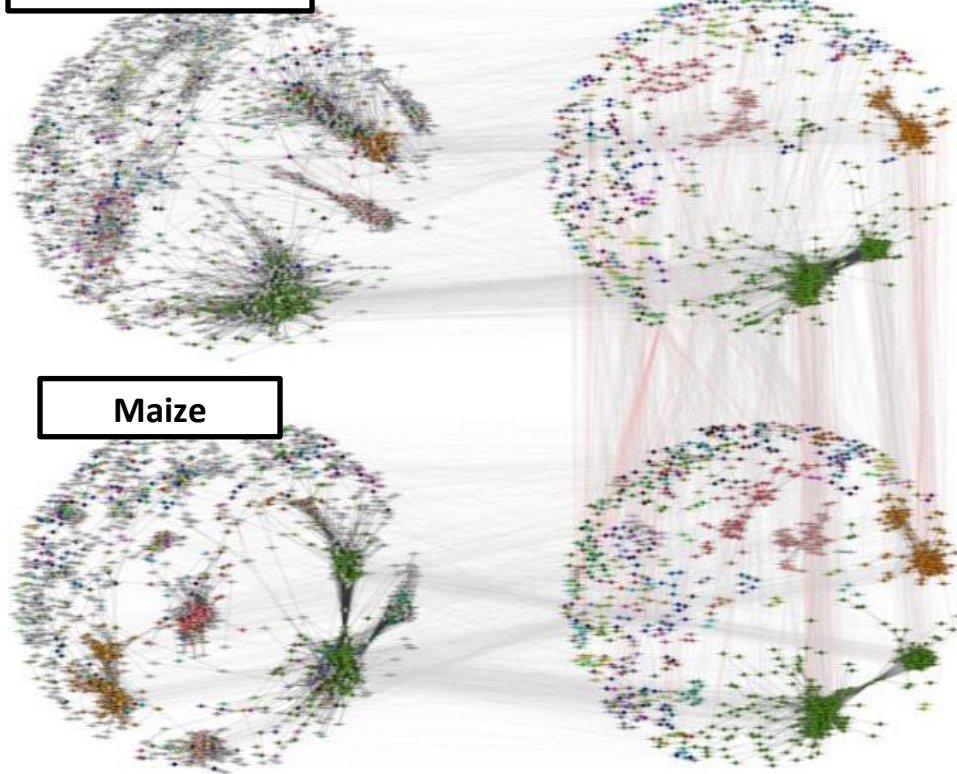
http://www.nexsteppe.com/wp-content/themes/nex/assets/images/sorghum_seedling.jpg



<http://faculty.agron.iastate.edu/mgsalas/img/tall-sorghum.jpg>

COMPLEX GENETIC SYSTEMS

Rice



Split Files

FastQ Files

Palmetto Cluster

Globus

Raw Sequences

OSG(Stash2)

Trim and Map

Compute Nodes

Alignment Files

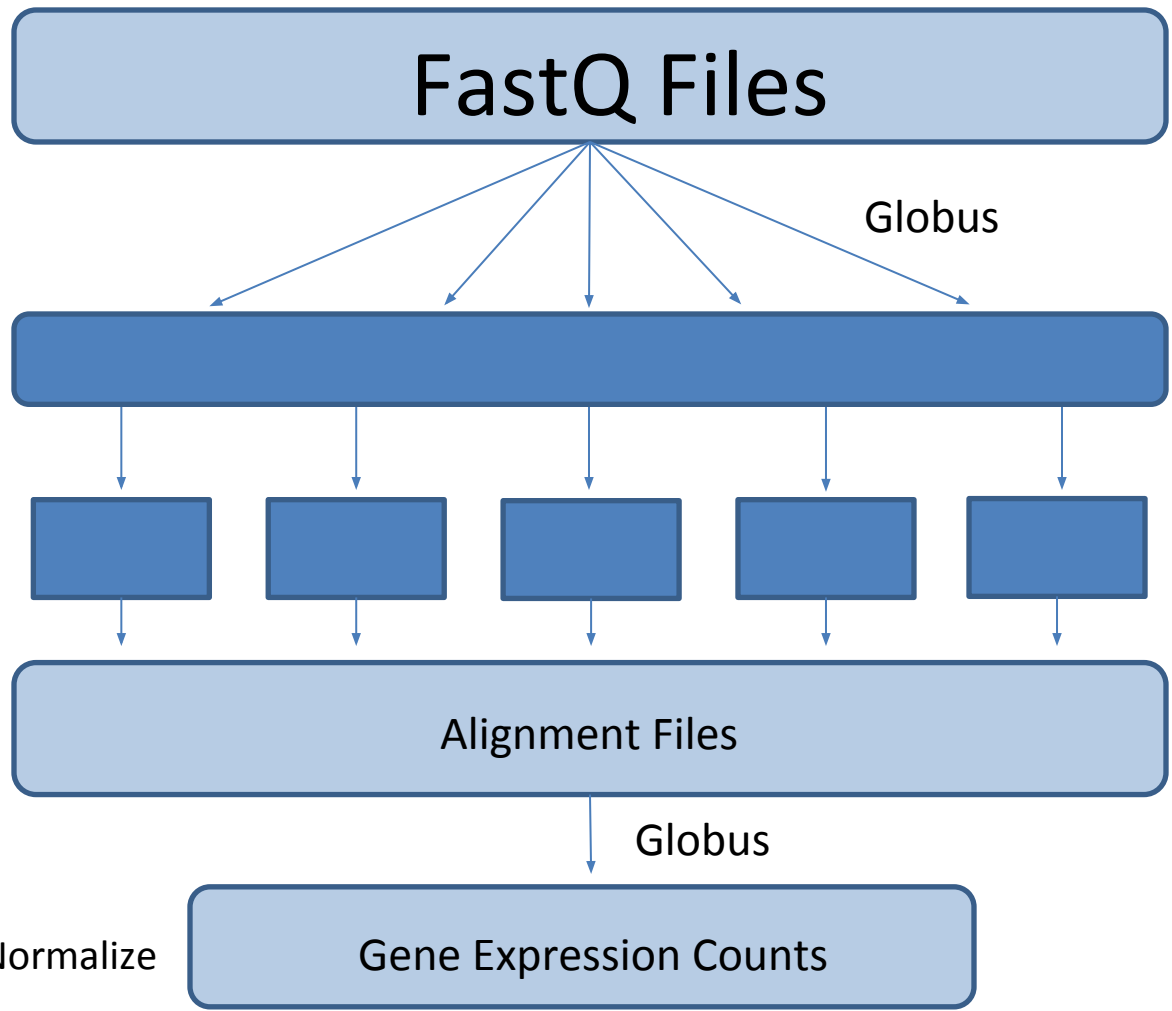
OSG(Stash2)

Globus

Merge, Annotate, Normalize

Gene Expression Counts

Palmetto Cluster



Big Data Workflow: Palmetto vs. OSG

Palmetto Cluster

- 100 Running jobs per dataset
- Walltime: 72 Hours
- Memory: 2 GB/Node
- Manually restart terminated/failed jobs
- Time to Completion:
~2 weeks

Open Science Grid

- 1,000 to 5,000 Running jobs per dataset
- Walltime: Less than 12 hours ideal
- Memory: 2 GB/Node
- Input transferred to remote node storage for computation
- Pegasus Workflow Manager:
 - Monitors job completion
 - Failed jobs automatically restarted
 - Output stored on scratch directory until workflow is complete
- Time to Completion: **~24 Hours**