CYVERSE™

Transforming Science Through Data-driven Discovery

CyVerse Overview

National Academies Special Topics Summer Institute on Quantitative Biology

Jason Williams – Lead, CyVerse – Education, Outreach, Training

Cold Spring Harbor Laboratory

williams@cshl.edu [@JasonWilliamsNY]

NSF

The University of Arizona

TACC Texas Advanced Computing Center

CSH Cold Spring Harbor Laboratory

UNCW

Download Slides and Follow Along

cyverse-qubes.readthedocs.io

CyVerse Evolution

iPlant 2008
Empowering a New Plant Biology

iPlant 2013
Cyberinfrastructure for Life Science

CyVerse 2016
Transforming Science Through Data-Driven Discovery

CyVerse Evolution

DBI-0735191 and DBI-1265383

We are funded by the National Science Foundation

- We are your colleagues and collaborators!
- $100 Million in investment
- Freely available to the community
- Spur national/international collaboration
- Cite CyVerse:
  CyVerse.org/acknowledge-cite-cyverse

CyVerse Evolution

CyVerse 2016
Transforming Science Through Data-Driven Discovery

Vision:

Transforming science through data-driven discovery

Mission:

Design, develop, deploy, and expand a national cyberinfrastructure for life science research, and train scientists in its use

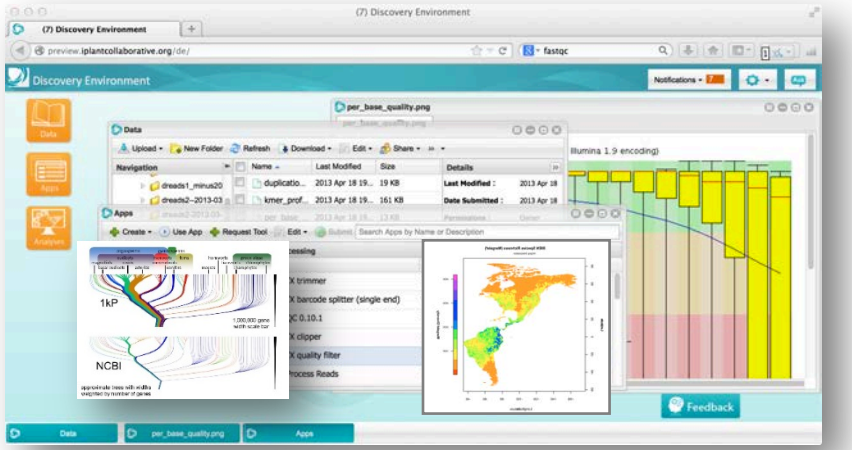
More than 30K users, PB of data, and hundreds of publications, courses, and discoveries

What is Cyberinfrastructure?

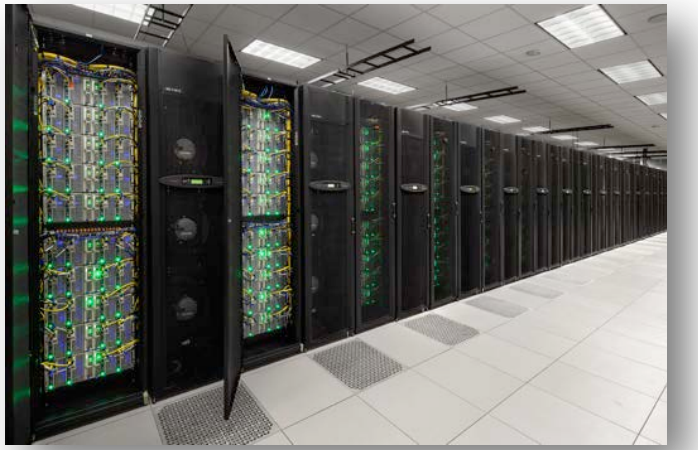
- Data storage
- Software
- High-performance computing
- People

organized into systems that solve problems of size and scope that would not otherwise be solvable.

What is Cyberinfrastructure?



Platforms, tools, datasets



Storage and compute

Training and support

CyVerse supports all domains of life science

Plant / Microbial

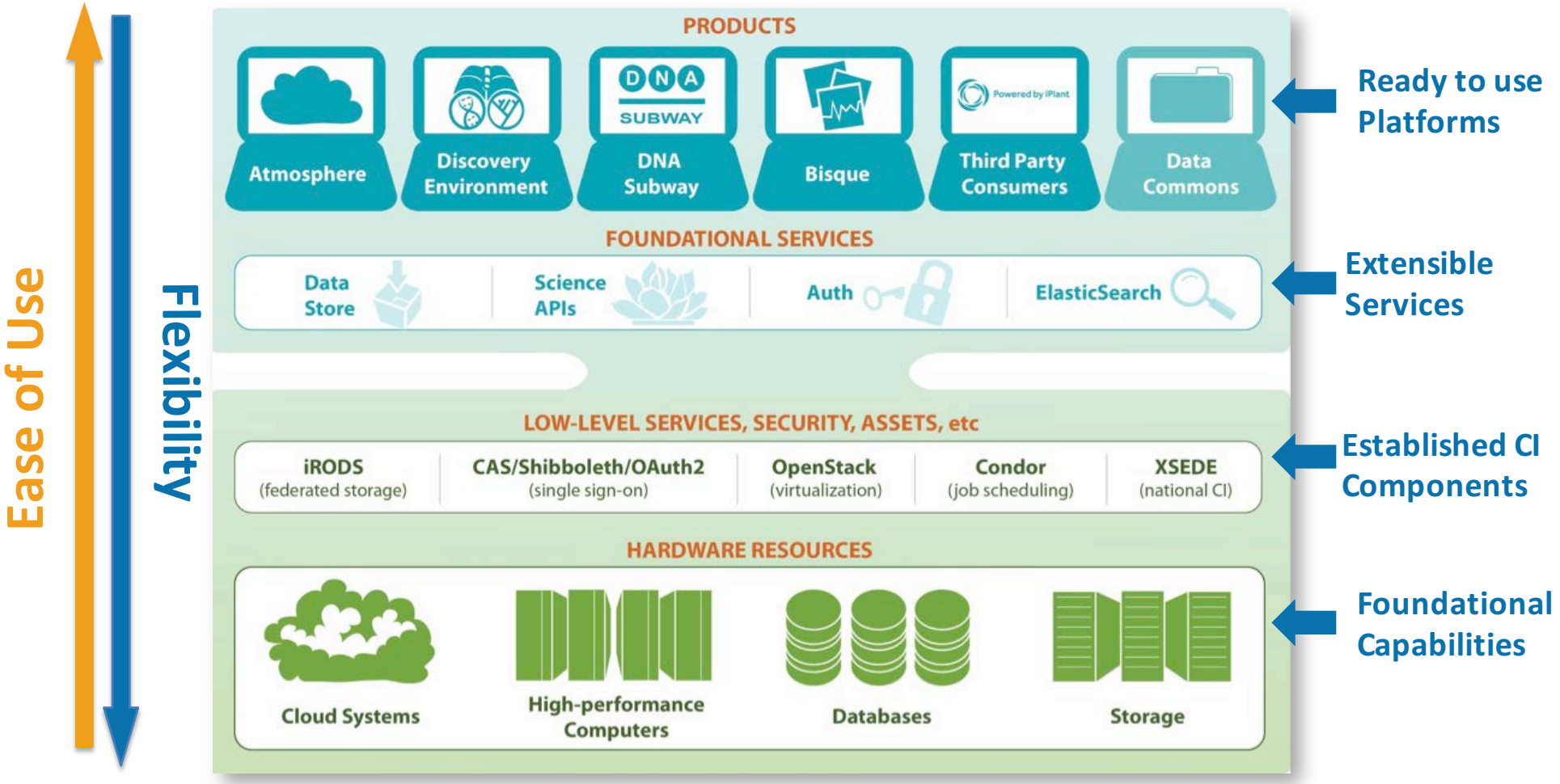
Animal

Biomedical

Ecological/Climate

CyVerse is built for Data

CyVerse product stack



How was CyVerse built?

Published online 3 September 2008 | *Nature* **455**, 16-21 (2008) | doi:10.1038/455016a

News Feature

Big data: Welcome to the petacentre

Nature **455**, 30 (4 September 2008) | doi:10.1038/455030a; Published online 3 September 2008

Big data: Distilling meaning from data

Felice Frankel[1] & Rosalind Reid[2]

Nature **455**, 28-29 (4 September 2008) | doi:10.1038/455028a; Published online 3 September 2008

Big data: How do your data grow?

Clifford Lynch[1]

1. Clifford Lynch is the executive director of the Coalition for Networked Information, 21 Dupont Circle, Washington DC 20036, USA, and an adjunct professor at the School of Information, University of California, Berkeley, California, 94720-4600, USA.
Email: cliff@cni.org

Scientists need to ensure that their results will be managed for the long haul. Maintaining data takes big organization, says Clifford Lynch.

Nature **455**, 1 (4 September 2008) | doi:10.1038/455001a; Published online 3 September 2008

Community cleverness required

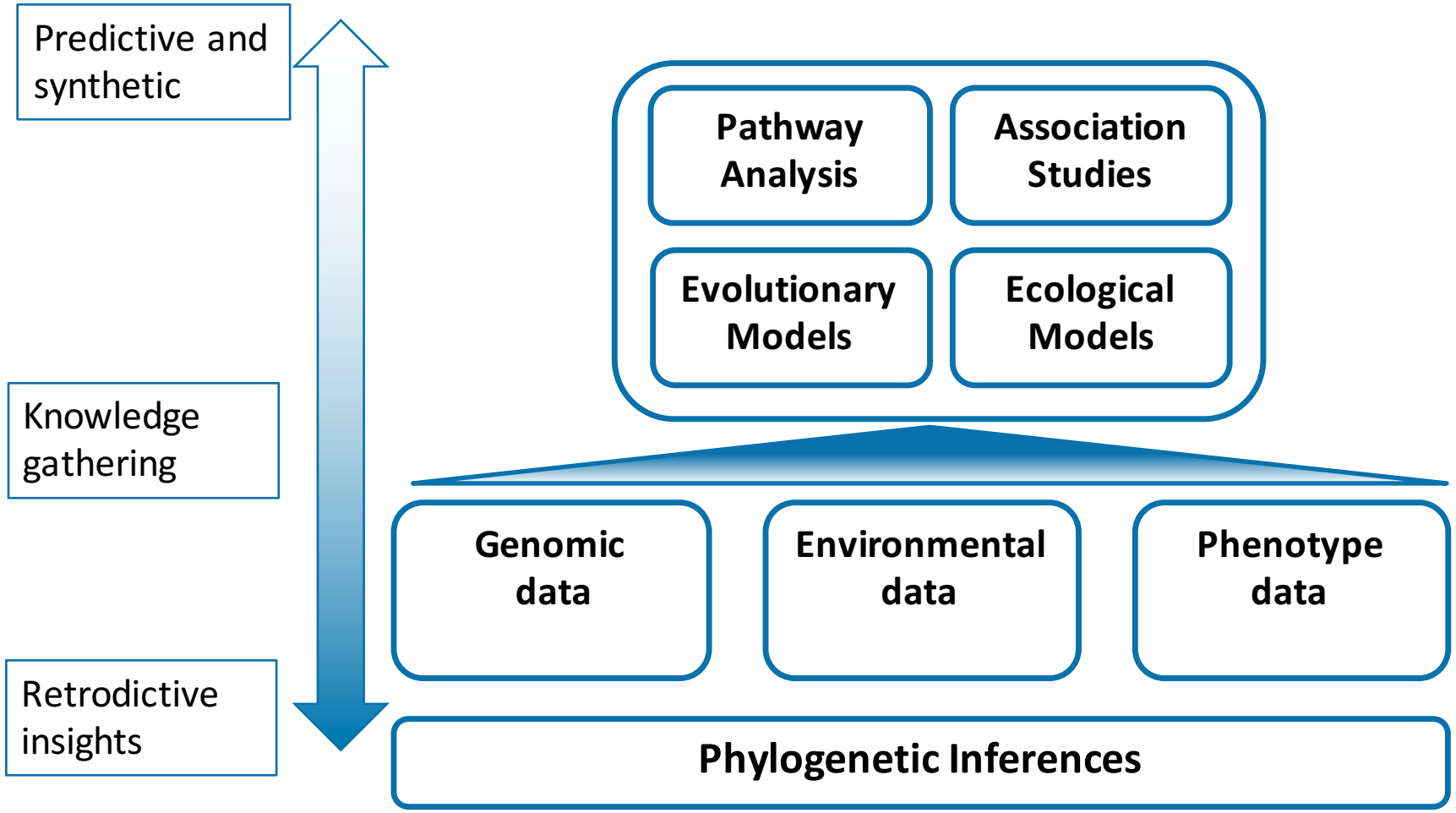
Researchers need to adapt their institutions and practices in response to torrents of new data — and need to complement smart science with smart searching.

CyVerse Community Priorities

Genomic data and analysis:

- Reference guided assembly
- De novo assembly
- RNA-Seq (expression; gene/isoform discovery)
- Variant calling
- Genome/Transcriptome annotation
- ChIP-Seq/Integration of epigenetic information
- Multiple sequencing platforms
- New and evolving technologies

CyVerse Community Priorities



CyVerse Institutions

THE UNIVERSITY OF ARIZONA

TACC
TEXAS ADVANCED COMPUTING CENTER

CSH
Cold Spring Harbor Laboratory

UNCW

CyVerse is a collaborative virtual organization

CyVerse UK

WARWICK
THE UNIVERSITY OF WARWICK

The University of Nottingham
UNITED KINGDOM · CHINA · MALAYSIA

UNIVERSITY OF LIVERPOOL

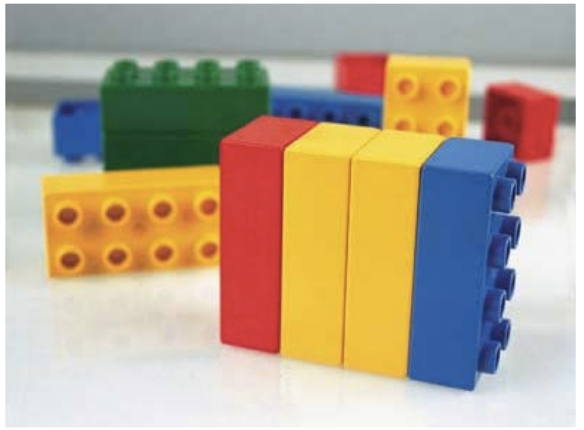
BBSRC

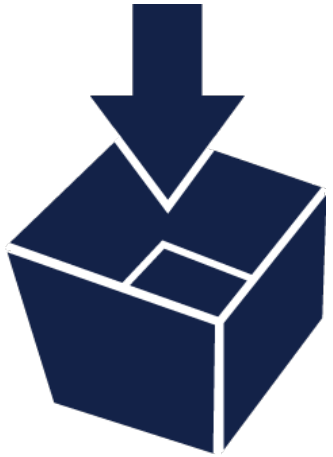
TGAC
The Genome Analysis Centre™

NSF

CyVerse Products

- We strive to be the **CI Lego blocks**
- Danish 'leg godt' - '**play well**'
- Also translates as '**I put together**' in Latin
- If a solution is not available you can craft your own using CyVerse CI components





Data Store

The resources you need to share and manage data with your lab, colleagues and community

- ✓ Initial 100 GB allocation – TB allocations available
- ✓ Automatic data backup
- ✓ Easy upload /download and sharing

Discovery Environment

Hundreds of bioinformatics Apps in an easy-to-use interface

- ✓ A platform that can run almost any bioinformatics application
- ✓ Seamlessly integrated with data and high performance computing
- ✓ User extensible – add your own applications

Atmosphere

Cloud computing for the life sciences

- ✓ Simple: One-click access to more than 200 virtual machine images
- ✓ Flexible: Fully customize your software setup
- ✓ Powerful: Integrated with iPlant computing and data resources

Science APIs

Fully customize *iPlant* resources

- ✓ Science-as-a-service platform
- ✓ Define your own compute, and storage resources (local and *iPlant*)
- ✓ Build your own app store of scientific codes and workflows

DNA Subway

Educational workflows for Genomes, DNA Barcoding, RNA-Seq

- ✓ Commonly used bioinformatics tools in streamlined workflows
- ✓ Teach important concepts in biology and bioinformatics
- ✓ Inquiry-based experiments for novel discovery and publication of data

Bisque

Image analysis, management, and metadata

- ✓ Secure image storage, analysis, and data management
- ✓ Integrate existing applications or create new ones
- ✓ Custom visualization and image handling routines and APIs

CYVERSE™

Transforming Science Through Data-driven Discovery

CyVerse Executive Team

THE UNIVERSITY OF ARIZONA®

Parker Antin
Nirav Merchant
Eric Lyons

TACC
TEXAS ADVANCED COMPUTING CENTER

Matt Vaughn

CSH Cold Spring Harbor Laboratory

Doreen Ware
Dave Micklos

CyVerse is supported by the National Science Foundation under Grant No. DBI-0735191 and DBI-1265383.