



# Facilitating Research Computing:

Accelerating Outcomes with Researchers

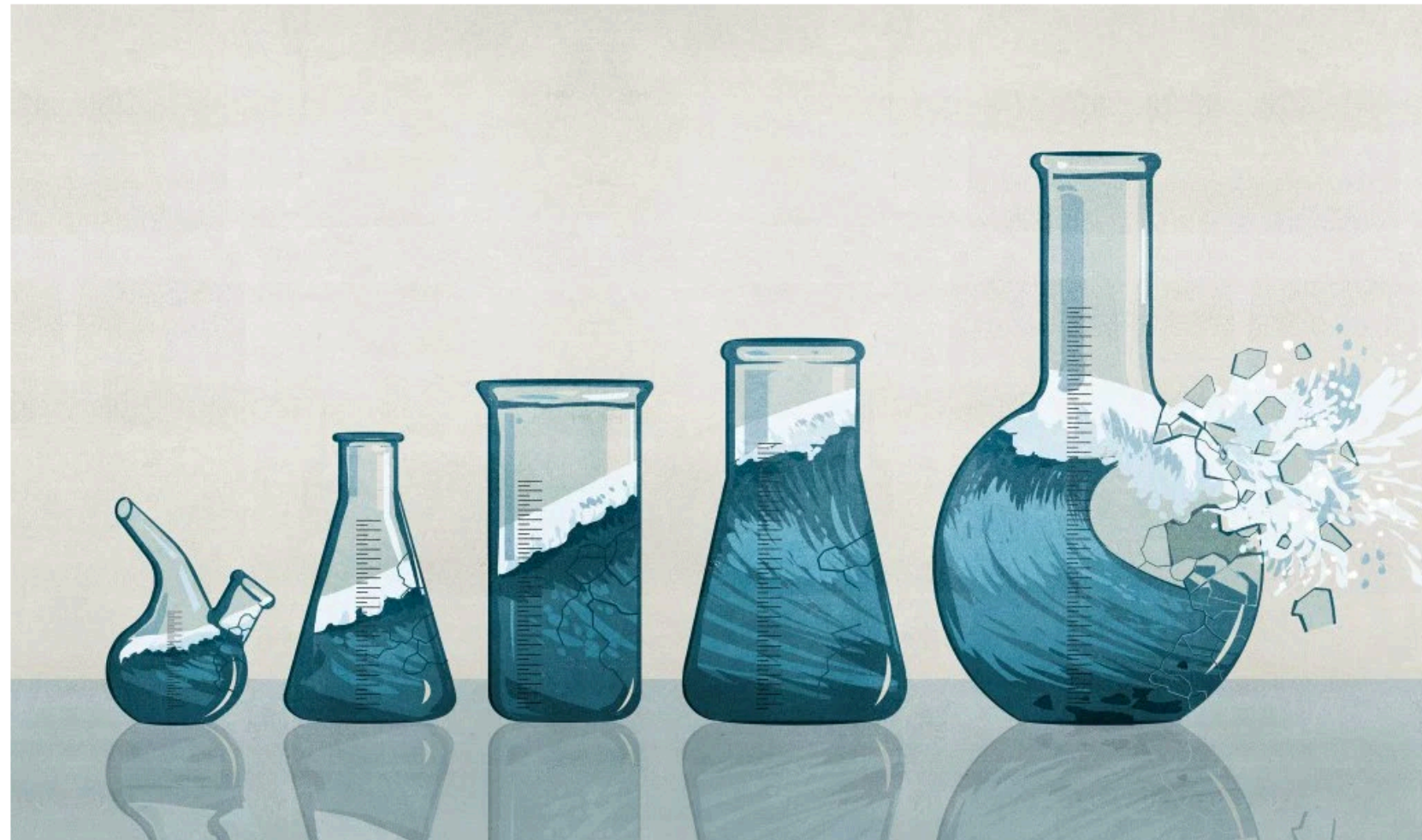
Mercè Crosas, Bob Freeman, Troy Adair,  
Simo Goshev, Amir Karger



# The Great Challenges (and Opportunities) of Today's Research

Science isn't broken  
 “It’s just a hell a lot  
 harder than we give  
 it credit for”

“answering even a simple  
 scientific question requires  
 lots of choices that can shape  
 the results. This doesn’t mean  
 that science is unreliable. It  
 just means that it’s more  
 challenging than we  
 sometimes give it credit for.”



THE SCIENTIFIC METHOD | 7:00 AM | AUG 19, 2015

## Science Isn't Broken

It's just a hell of a lot harder than we give it credit for.

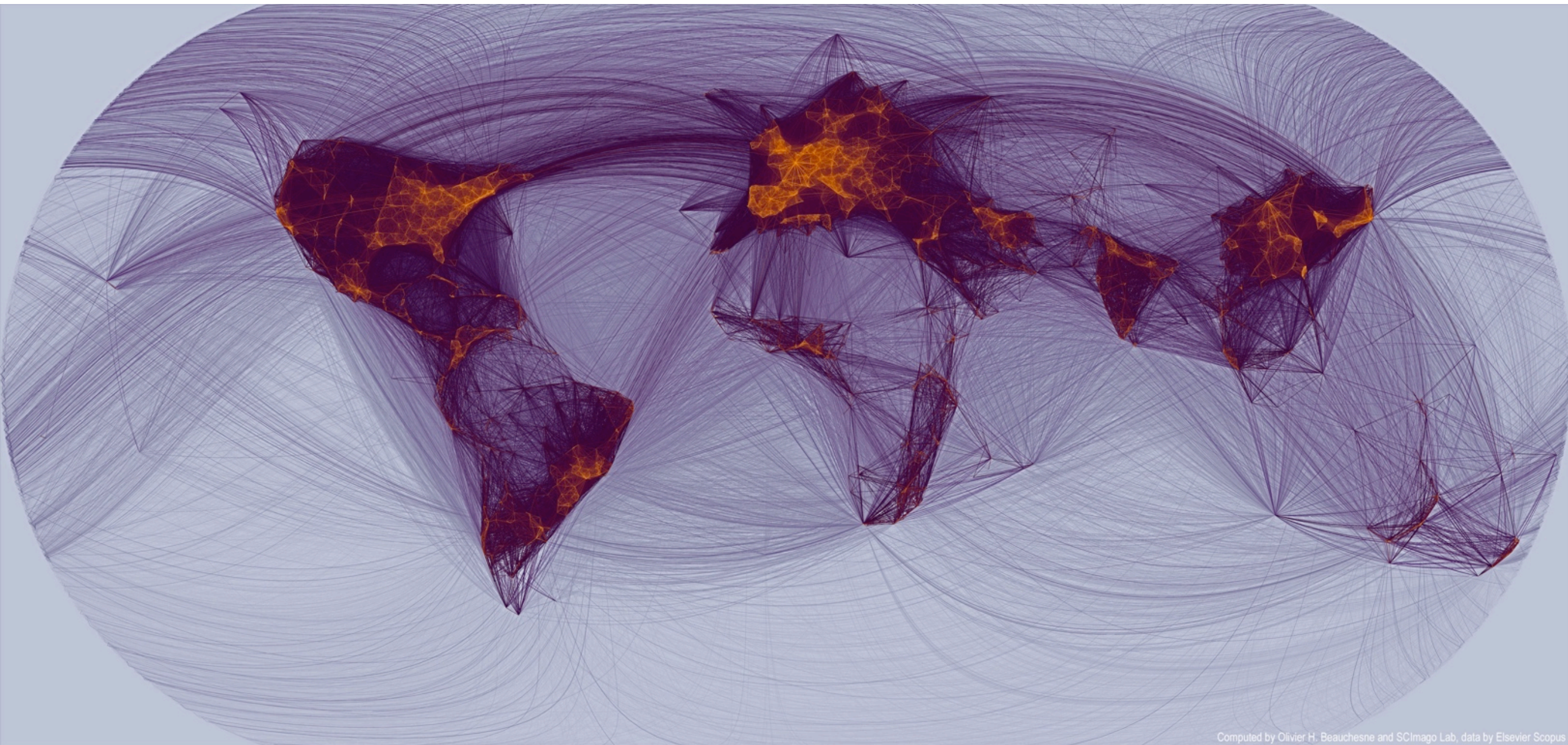
By CHRISTIE ASCHWANDEN

Graphics by RITCHIE KING

If you follow the headlines, your confidence in science may have taken a hit lately. Peer review? More like self-review. An investigation in November uncovered a scam in which [researchers were rubber-stamping their own work](#), circumventing peer review at five high-profile



# Research is Increasingly Collaborative

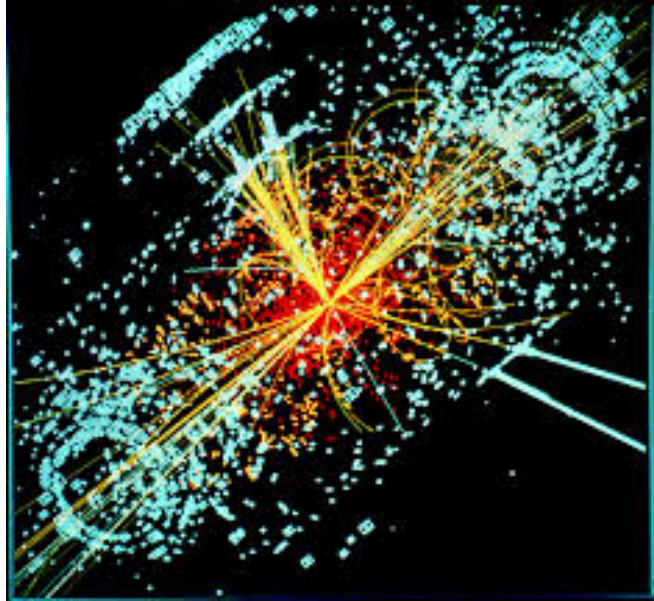


“Bright lines in this map of scientific collaborations between 2005 and 2009 show many joint publications.”

*Collaborations: The Rise of Research Networks*, *The Nature* **490**, 335–336 (18 October 2012) doi:10.1038/490335a



# ... and Increasingly Big

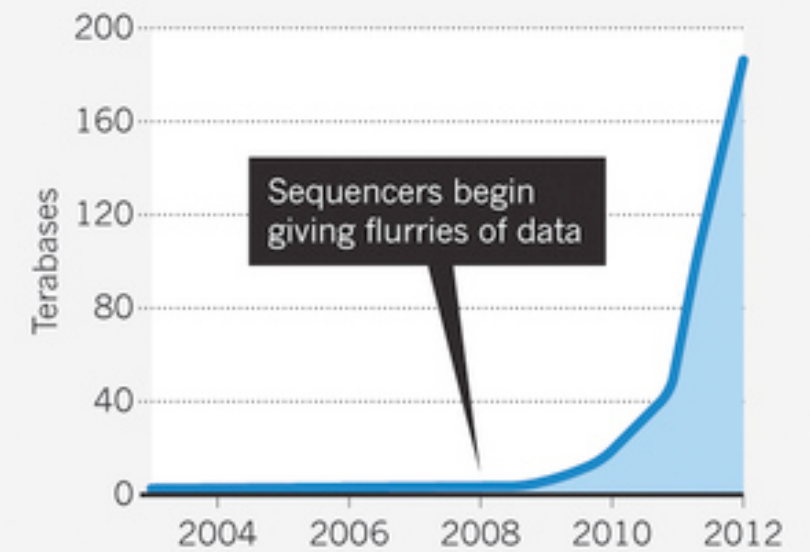


CERN: High-Energy Physics Data > 100PB

EBI: Sequence Data > 20PB

## DATA EXPLOSION

The amount of genetic sequencing data stored at the European Bioinformatics Institute takes less than a year to double in size.



Entire Data created by all of us > ZB = 1 million PB



If the Digital Universe were represented by the memory in a stack of tablets, in 2013 it would have stretched two-thirds the way to the Moon\*

By 2020, there would be 6.6 stacks from the Earth to the Moon\*

# Research Data and Computing Become Increasingly Complex and Inter-connected



How does Harvard help you  
today?

# Training on Research Programming

R

Python

STATA

GIS

## Research Computing and Data Science Facilitators

HMS

6 research  
consultants

FAS

(sciences)  
6 research  
consultants

IQSS

(social sciences)  
3.5 research  
consultants

HBS

7 research  
consultants

## Research Computing Facilities @Harvard

HMS  
Orchestra

Cores: 6,500  
Storage: 27PB

FAS  
Odyssey

Cores: 60,000  
Storage: 26PB

IQSS  
RCE

Cores: 1,704  
Storage: 100TB

HBS  
Research Grid

Cores: 384  
Storage: 150TB