

A dramatic seascape featuring a large, powerful wave crashing against a dark, rocky cliff on the left. The sky is filled with heavy, dark clouds, with a hint of light breaking through near the horizon. The water is a deep blue-green color, and the overall atmosphere is moody and intense.

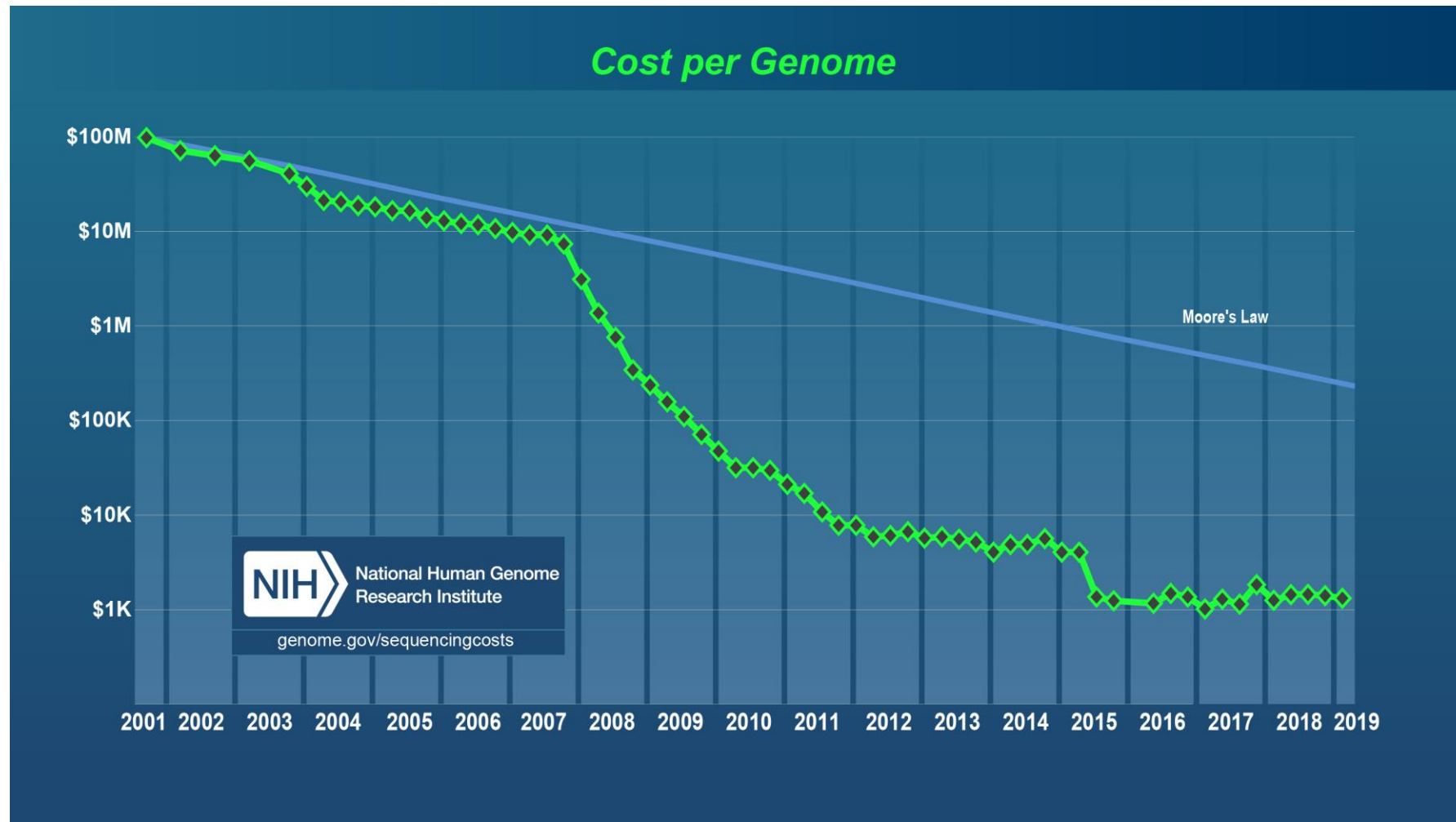
Welcome!

# Marine Genomics

# What is Marine Genomics?

Using genomic data to answer questions about the evolutionary biology of marine organisms.

# Genomic data is becoming more and more accessible ( == cheaper)



# Major evolutionary questions in Marine Biology

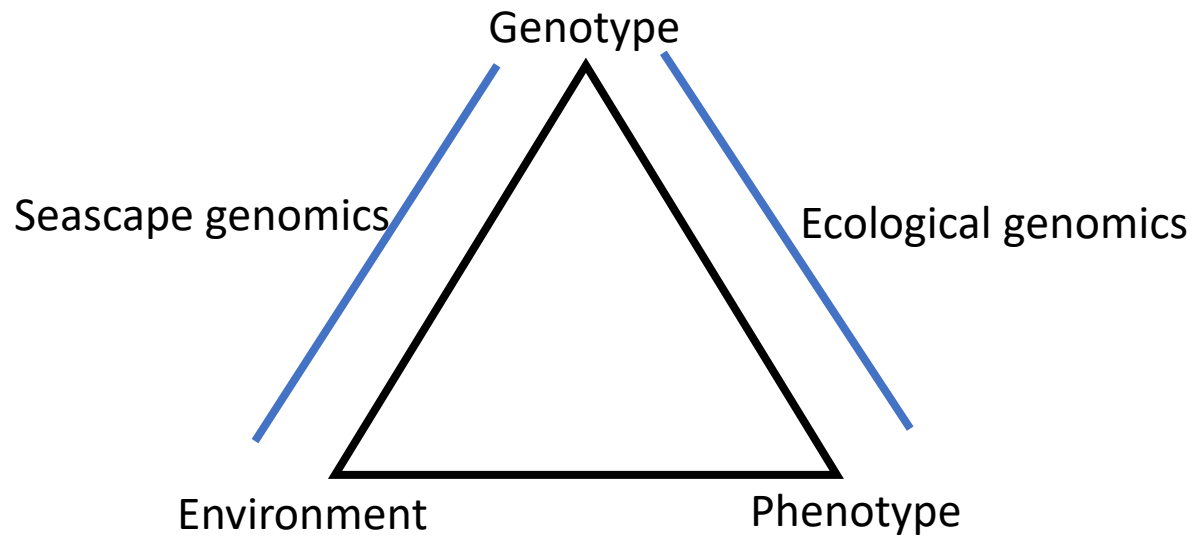
What limits range size? Is there local adaptation at a species range limits?

What influences patterns of gene flow and migration and how does gene flow and migration impact selection or local adaptation?

What are the primary selective factors shaping phenotypic variation?




# What is Marine Genomics?



# MOLECULAR ECOLOGY

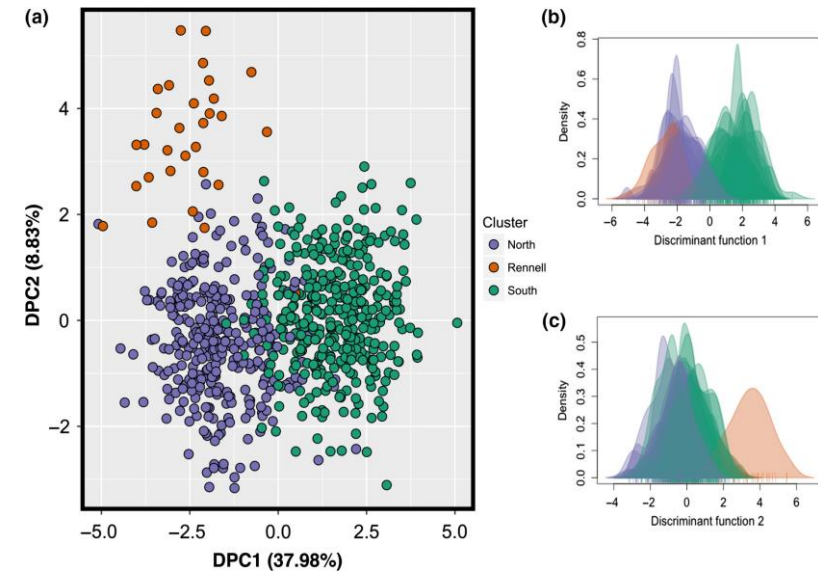
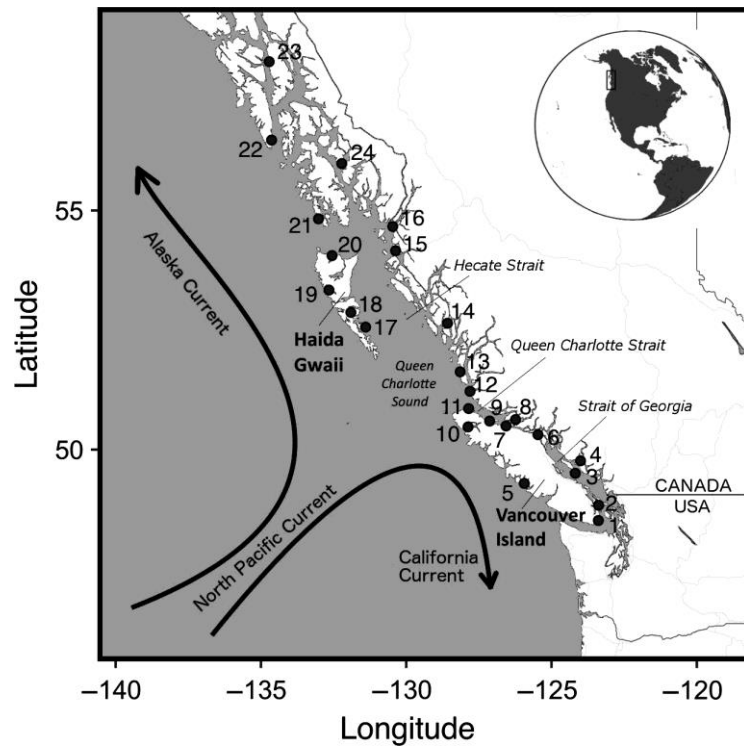
ORIGINAL ARTICLE | [Full Access](#)

## Asymmetric oceanographic processes mediate connectivity and population genetic structure, as revealed by RADseq, in a highly dispersive marine invertebrate (*Parastichopus californicus*)

Amanda Xuereb , Laura Benestan, Éric Normandeau, Rémi M. Daigle, Janelle M. R. Curtis, Louis Bernatchez, Marie-Josée Fortin

First published: 14 April 2018 | <https://doi.org/10.1111/mec.14589> | Citations: 35

[UC-eLinks](#)





## A Genome-Wide Association Study Identifies the Genomic Region Associated with Shell Color in Yesso Scallop, *Patinopecten yessoensis*

Liang Zhao<sup>1</sup> · Yangping Li<sup>1</sup> · Yajuan Li<sup>1</sup> · Jiachen Yu<sup>1</sup> · Huan Liao<sup>1</sup> · Shuyue Wang<sup>1</sup> · Jia Lv<sup>1</sup> · Jun Liang<sup>2</sup> · Xiaoting Huang<sup>1</sup> · Zhenmin Bao<sup>1,3</sup>

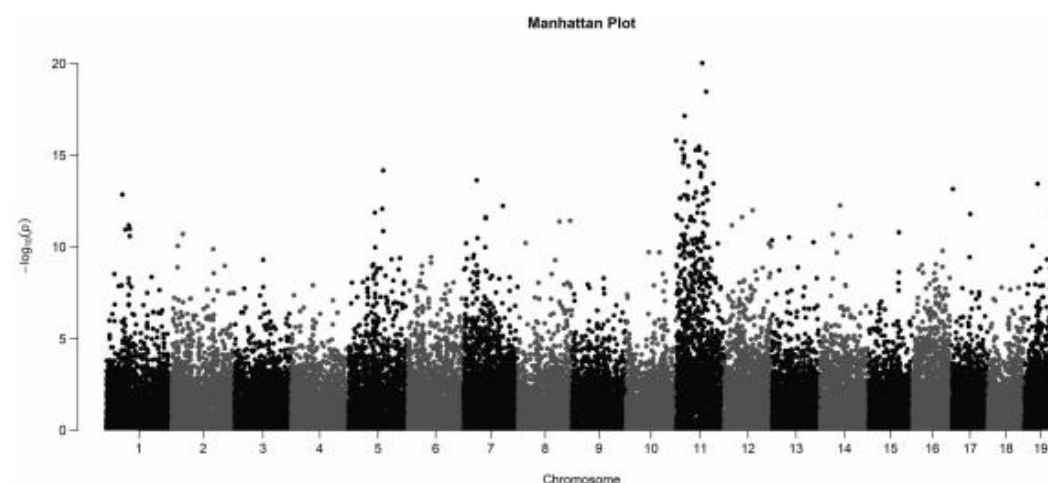


Fig. 2 Manhattan plot of  $-\log_{10}(P)$  value for genome-wide association study

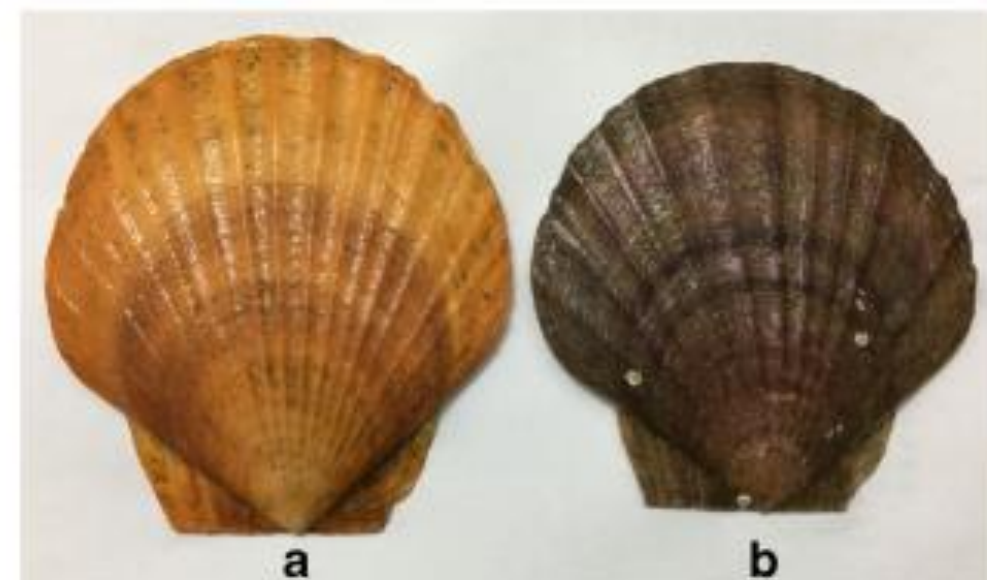


Fig. 1 Reddish-orange shell variant (a) and brown shell variant (b) of Yesso scallop, *Patinopecten yessoensis*

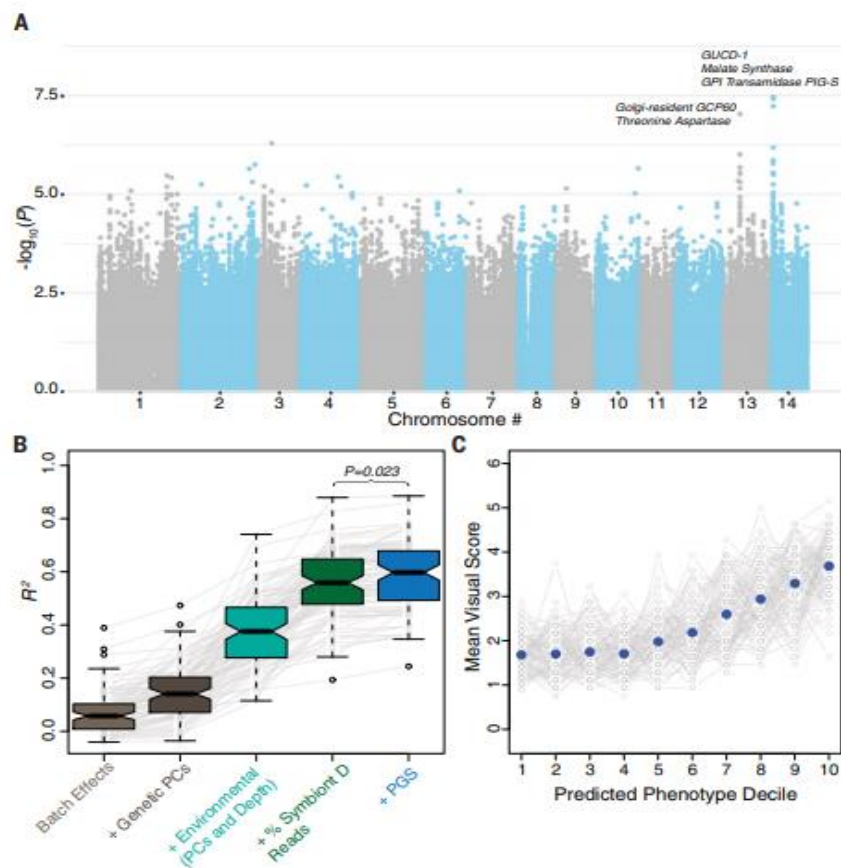


## RESEARCH ARTICLE SUMMARY

### CORAL GENOMICS


# Population genetics of the coral *Acropora millepora*: Toward genomic prediction of bleaching

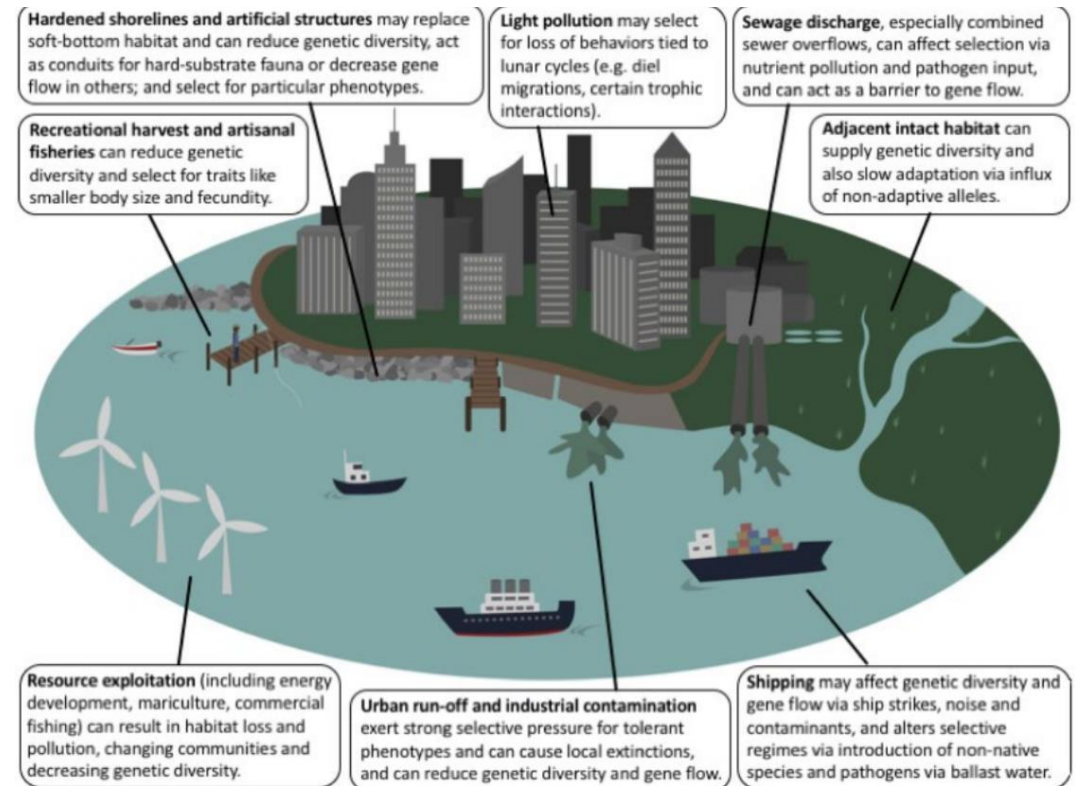
Zachary L. Fuller\*, Veronique J. L. Mocellin, Luke A. Morris, Neal Cantin, Jihanne Shepherd, Luke Sarre, Julie Peng, Yi Liao, Joseph Pickrell, Peter Andolfatto, Mikhail Matz†, Line K. Bay\*†, Molly Przeworski\*†





## Evolutionary responses of marine organisms to urbanized seascapes

S. Elizabeth Alter<sup>1,2,3</sup>  | Laraib Tariq<sup>2</sup> | James Keanu Creed<sup>2,3</sup> | Emmanuel Megafu<sup>2</sup>



# How do we do marine genomics?

Research idea/question

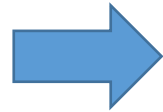


Design experiment

Lab experiment  
Field collection scheme



Extract DNA/RNA



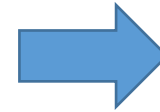
**NEXT GENERATION  
SEQUENCING**

AN INTRODUCTION

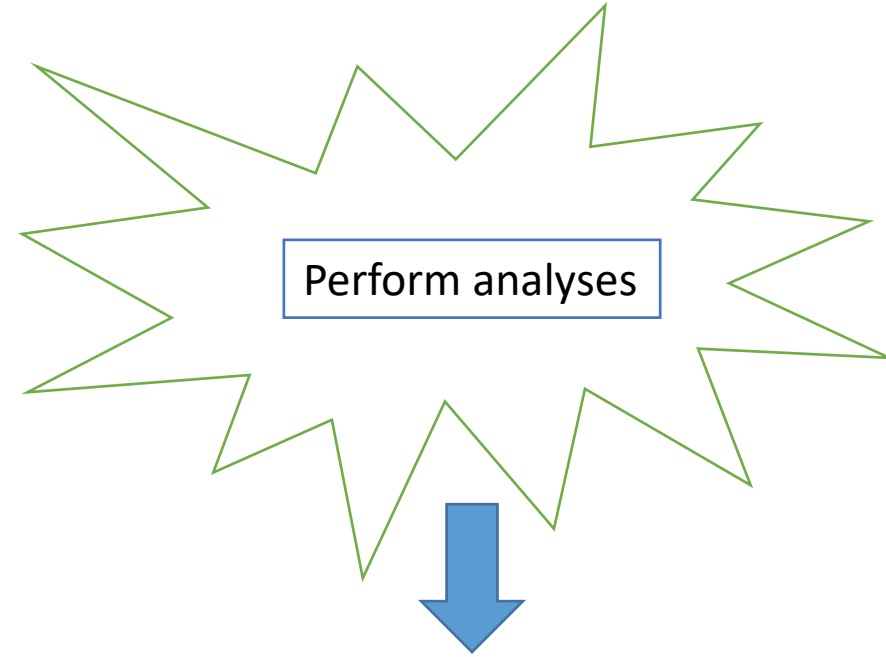


[https://www.youtube.com/watch?v=jFCD8Q6qSTM  
&ab\\_channel=AppliedBiologicalMaterials-abm](https://www.youtube.com/watch?v=jFCD8Q6qSTM&ab_channel=AppliedBiologicalMaterials-abm)

Download data



Perform analyses



Present results at conference  
Publish paper

# We use bioinformatics to answer these questions

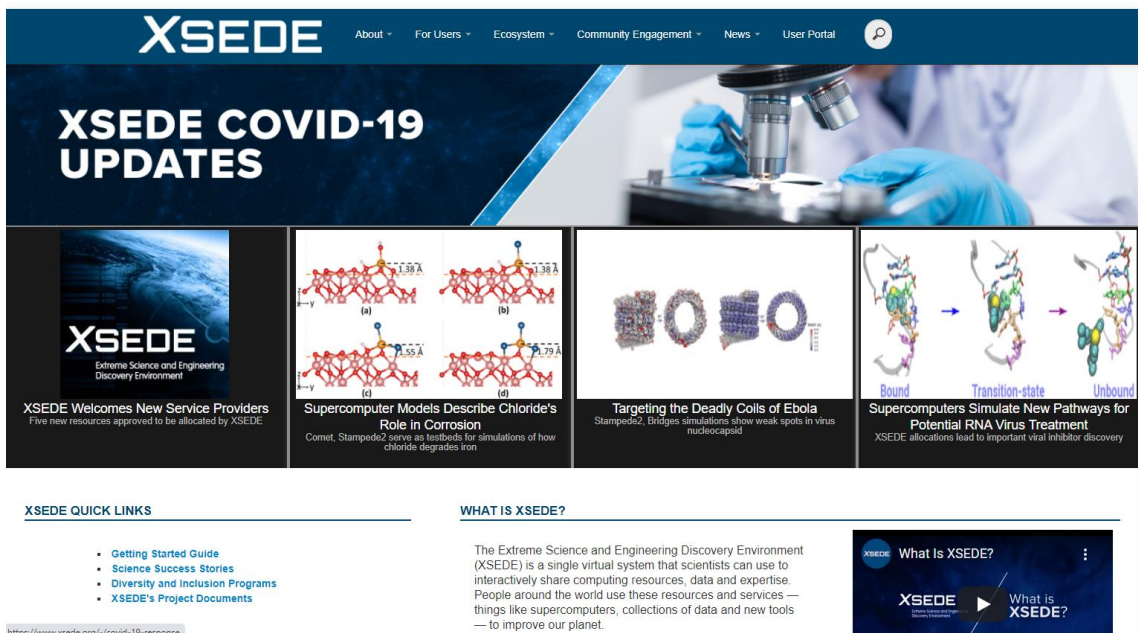
We'll cover two main areas

- The shell or Bash/UNIX
- R

Many of these analyses are very computationally intensive



# Jetstream via xsede



The XSEDE website homepage features a dark blue header with the XSEDE logo and navigation links: About, For Users, Ecosystem, Community Engagement, News, and User Portal. A large banner for 'XSEDE COVID-19 UPDATES' is prominently displayed. Below the banner, there are four featured articles: 'XSEDE Welcomes New Service Providers', 'Supercomputer Models Describe Chloride's Role in Corrosion', 'Targeting the Deadly Coils of Ebola', and 'Supercomputers Simulate New Pathways for Potential RNA Virus Treatment'. A 'XSEDE QUICK LINKS' section is located at the bottom left, and a 'WHAT IS XSEDE?' section is at the bottom right.

**XSEDE**  
Extreme Science and Engineering  
Discovery Environment

**XSEDE COVID-19 UPDATES**

**XSEDE Welcomes New Service Providers**  
Five new resources approved to be allocated by XSEDE.

**Supercomputer Models Describe Chloride's Role in Corrosion**  
Comet, Stampede2 serve as testbeds for simulations of how chloride degrades iron.

**Targeting the Deadly Coils of Ebola**  
Stampede2, Bridges simulations show weak spots in virus nucleocapsid.

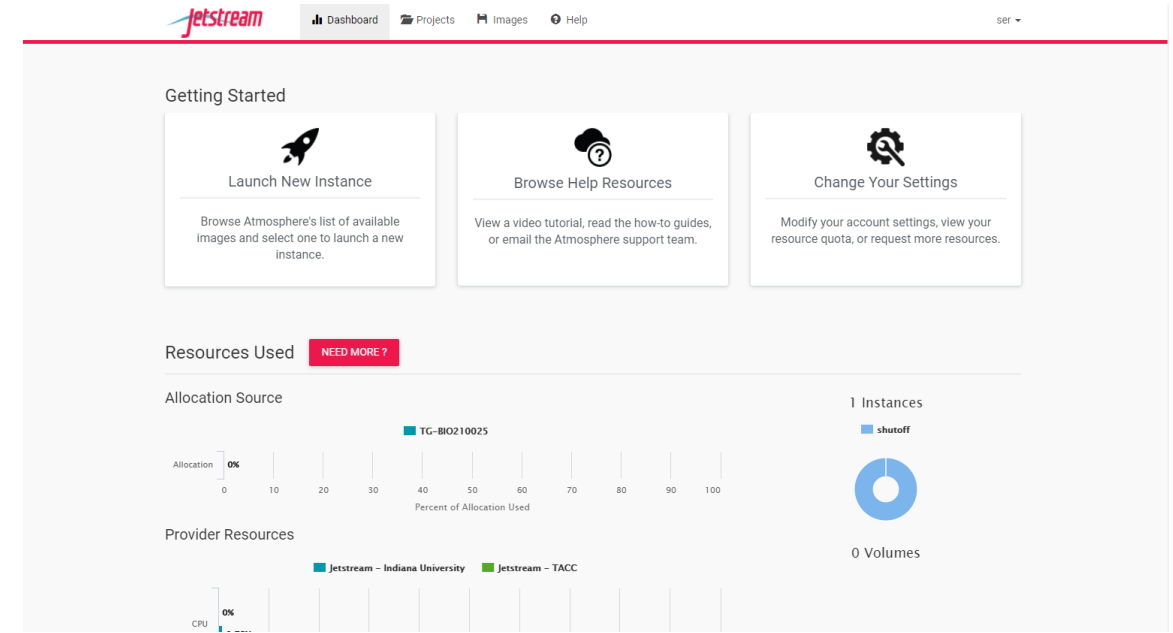
**Supercomputers Simulate New Pathways for Potential RNA Virus Treatment**  
XSEDE allocations lead to important viral inhibitor discovery.

**XSEDE QUICK LINKS**

- Getting Started Guide
- Science Success Stories
- Diversity and Inclusion Programs
- XSEDE's Project Documents

**WHAT IS XSEDE?**

The Extreme Science and Engineering Discovery Environment (XSEDE) is a single virtual system that scientists can use to interactively share computing resources, data and expertise. People around the world use these resources and services — things like supercomputers, collections of data and new tools — to improve our planet.



The Jetstream dashboard features a red header with the Jetstream logo and navigation links: Dashboard, Projects, Images, and Help. The main content area is divided into three sections: 'Getting Started', 'Resources Used', and 'Provider Resources'. The 'Getting Started' section includes links to 'Launch New Instance', 'Browse Help Resources', and 'Change Your Settings'. The 'Resources Used' section shows a bar chart for 'Allocation Source' and a 'NEED MORE?' button. The 'Provider Resources' section shows a bar chart for 'CPU' usage.

**Jetstream**

Dashboard Projects Images Help

**Getting Started**

- Launch New Instance**  
Browse Atmosphere's list of available images and select one to launch a new instance.
- Browse Help Resources**  
View a video tutorial, read the how-to guides, or email the Atmosphere support team.
- Change Your Settings**  
Modify your account settings, view your resource quota, or request more resources.

**Resources Used** **NEED MORE ?**

**Allocation Source**

Allocation 0% 10 20 30 40 50 60 70 80 90 100

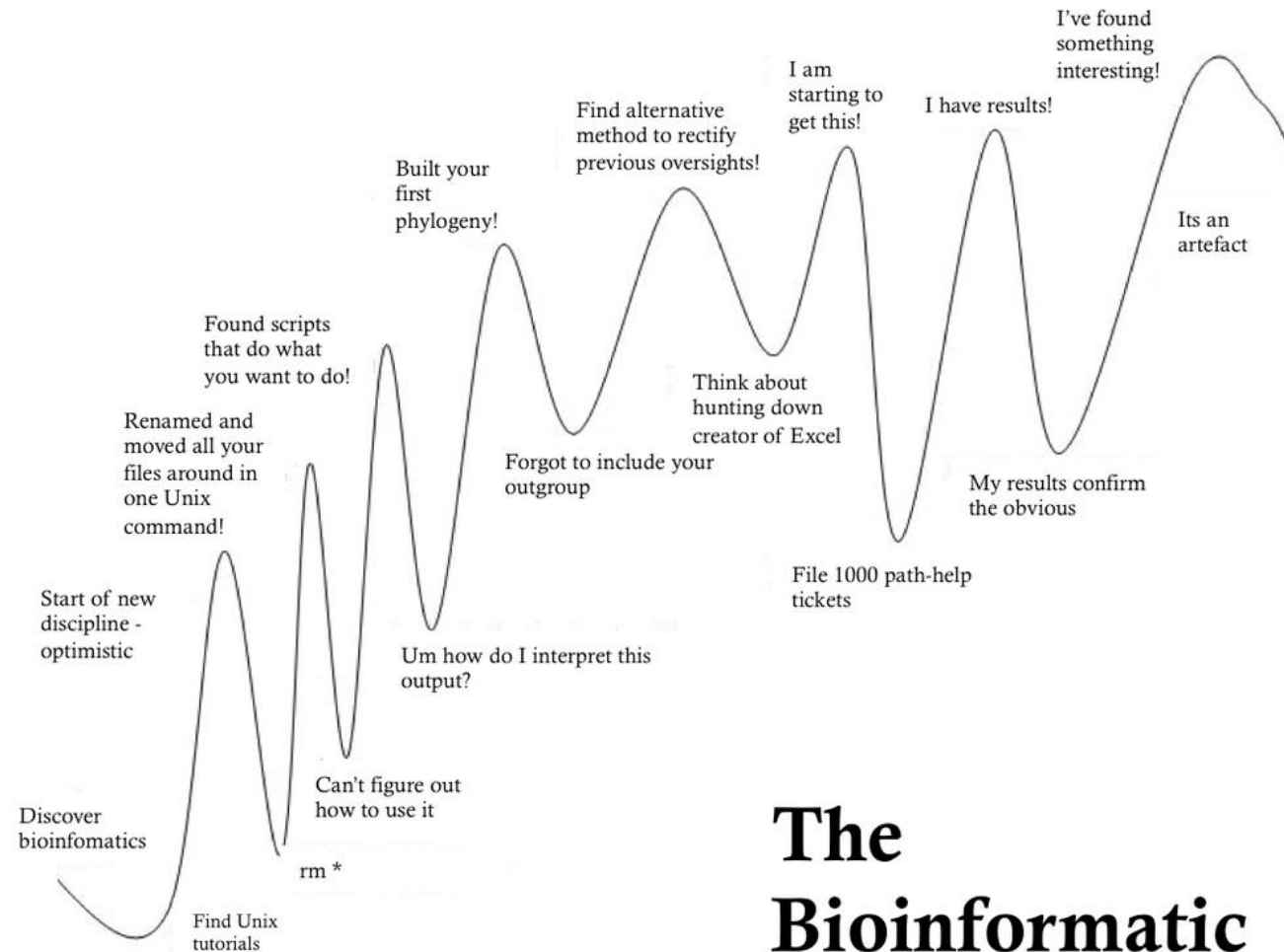
Percent of Allocation Used

**Provider Resources**

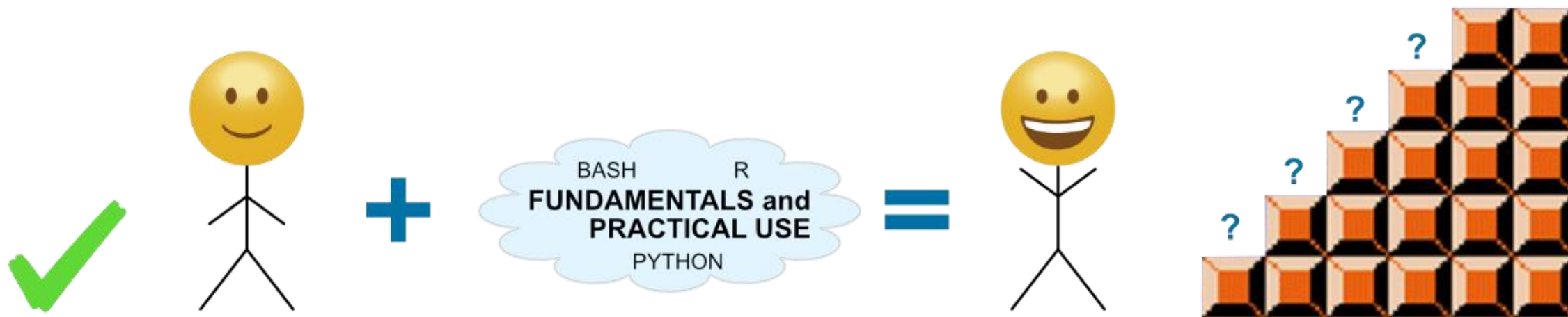
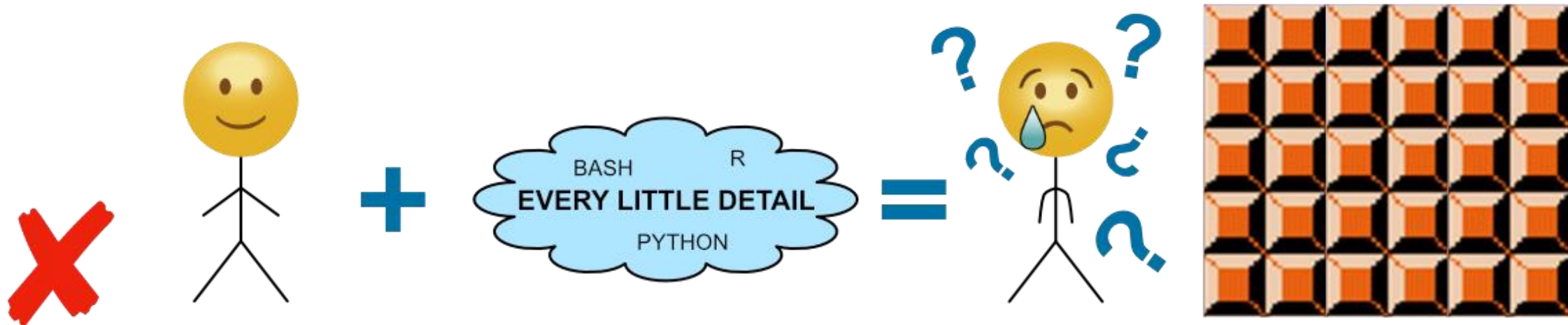
CPU 0% 10 20 30 40 50 60 70 80 90 100

**1 Instances**

**0 Volumes**



# The Bioinformatic learning curve





# Why learn bioinformatics?

Gain many transferable skills!

- Data science
- Personalized medicine
- NGO agency scientist

Undergraduate degree

- Grad school
  - Postdoc
    - Professor
    - Research scientist in industry

freenome

Multomics PREEMPT CRC™ Study About Careers News Science Blog

f t in



Spot the pattern,  
**treat the cancer.**

At Freenome, we're connecting people with next-generation blood tests for early cancer detection powered by our multomics platform.



Spotify®

Glossier.