# CMSC 423: Introduction to Biology and Bioinformatics

Part 3

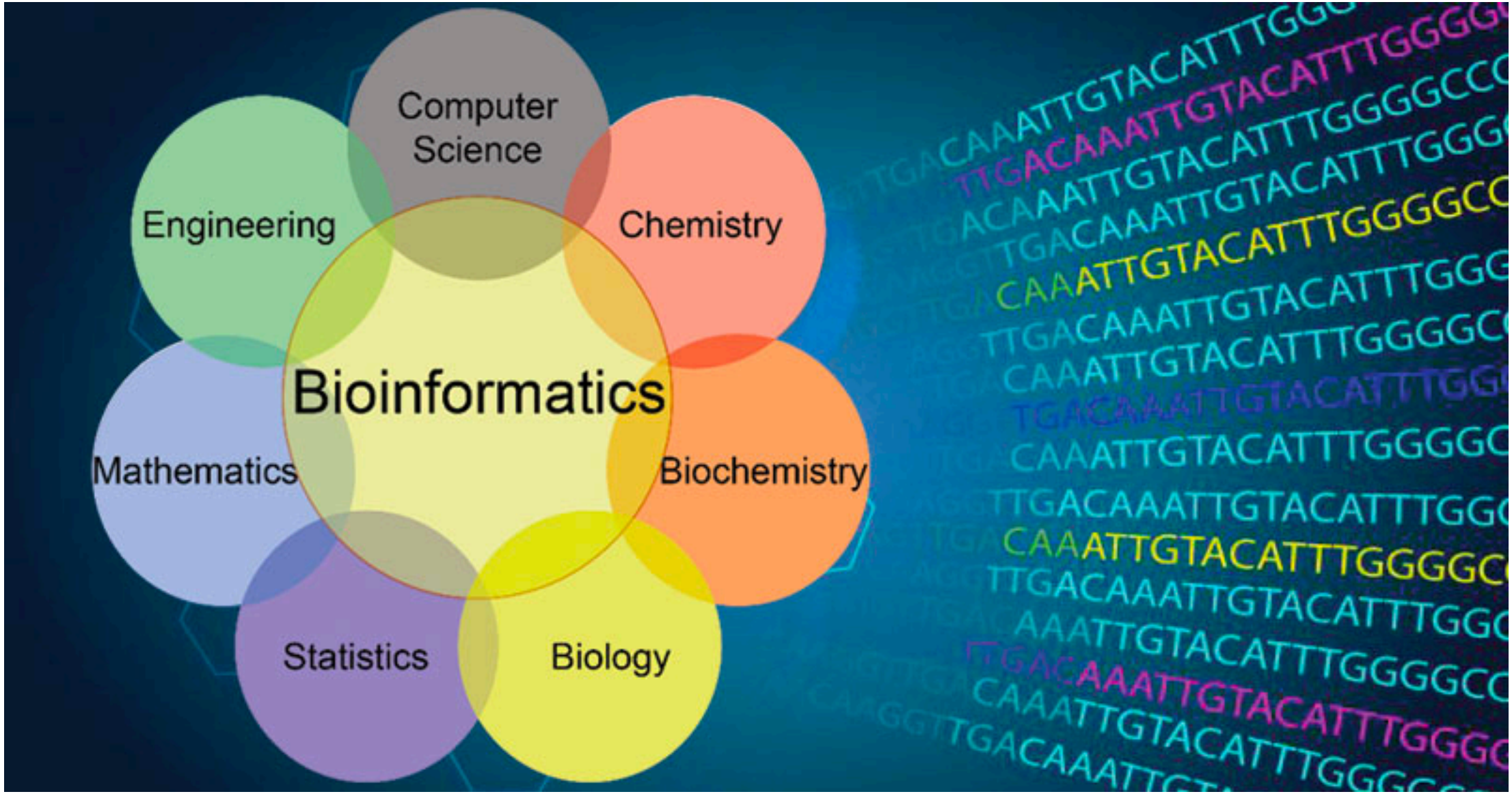
- Part 1: The Central Dogma
- Part 2: DNA Sequencing
- Part 3: Bioinformatics Applications

# Bioinformatics

From Wikipedia, the free encyclopedia

*For the journal, see Bioinformatics (journal).*

**Bioinformatics** /ˌbaɪ.oʊˌɪnfərˈmætɪks/ (listen) is an interdisciplinary field that develops methods and software tools for understanding biological data, in particular when the data sets are large and complex. As an interdisciplinary field of science, bioinformatics combines biology, computer science, information engineering, mathematics and statistics to analyze and interpret the biological data. Bioinformatics has been used for *in silico* analyses of biological queries using mathematical and statistical techniques.[*clarification needed*]




https://163602-560839-raikfcquaxqncofqfm.stackpathdns.com/wp-content/uploads/2018/12/Bioinformatics-Introduction-and-Applications.jpg

# Brief History of Bioinformatics

- **1950-1970:** Before desktop computers and DNA sequencing, early bioinformatics focused on studying proteins
- **1970-1980:** Shift from protein to DNA analysis
- **1980-1990:** Parallel advances in biology and computer science
- **1990-2000:** Use of the internet and Human Genome Project drive progress
- **2000-2010:** Introduction of next-generation sequencing causes exponential growth of data

Jeff Gauthier, Antony T Vincent, Steve J Charette, Nicolas Derome, A brief history of bioinformatics, *Briefings in Bioinformatics*, Volume 20, Issue 6, November 2019, Pages 1981–1996, https://doi-org.proxy-um.researchport.umd.edu/10.1093/bib/bby063

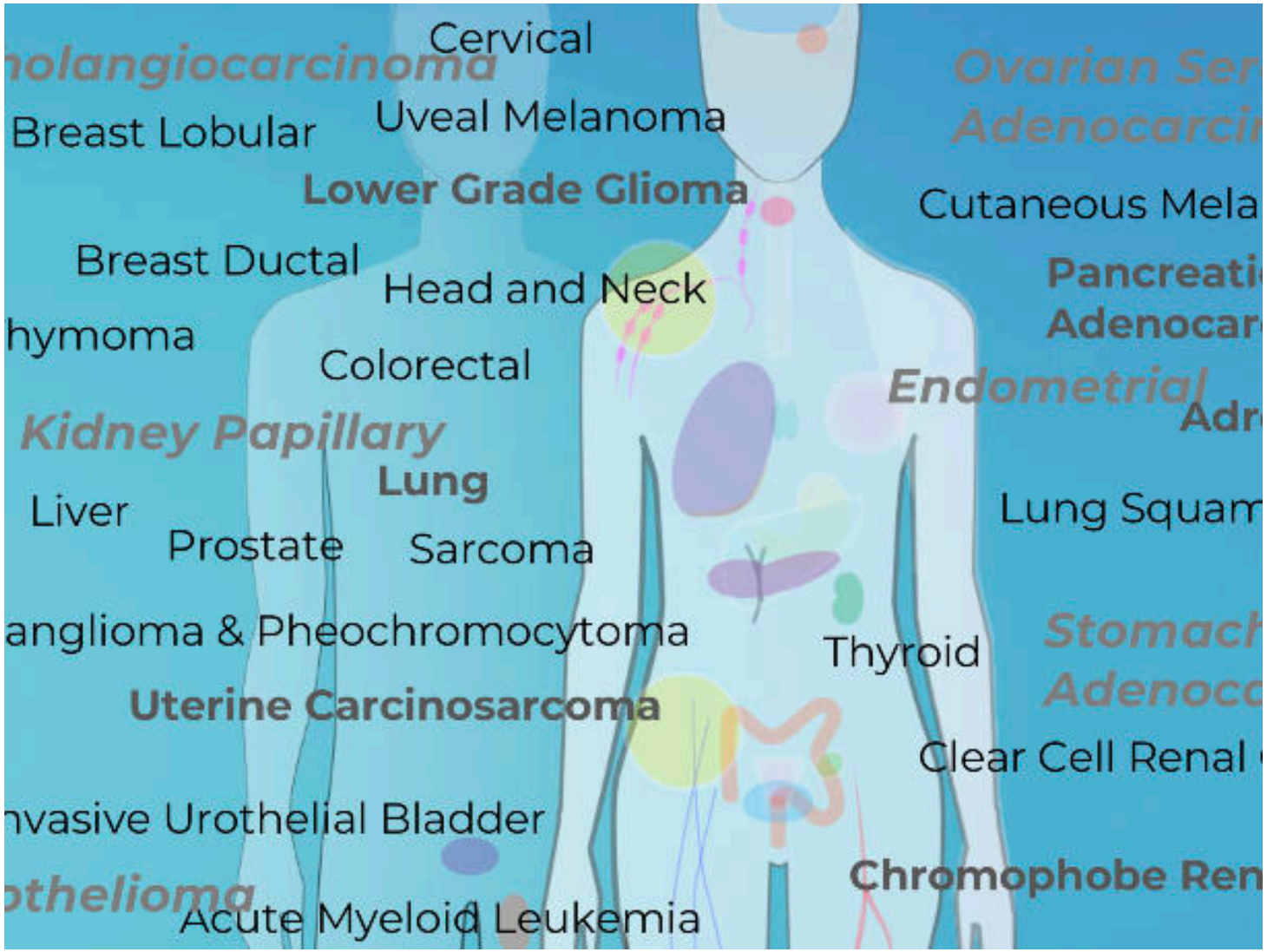
# The Human Genome Project

- Started in 1990, Completed in 2003
- Sequenced the 3 billion DNA letters in the human genome
- Covers about 99 percent of the human genome's gene containing regions

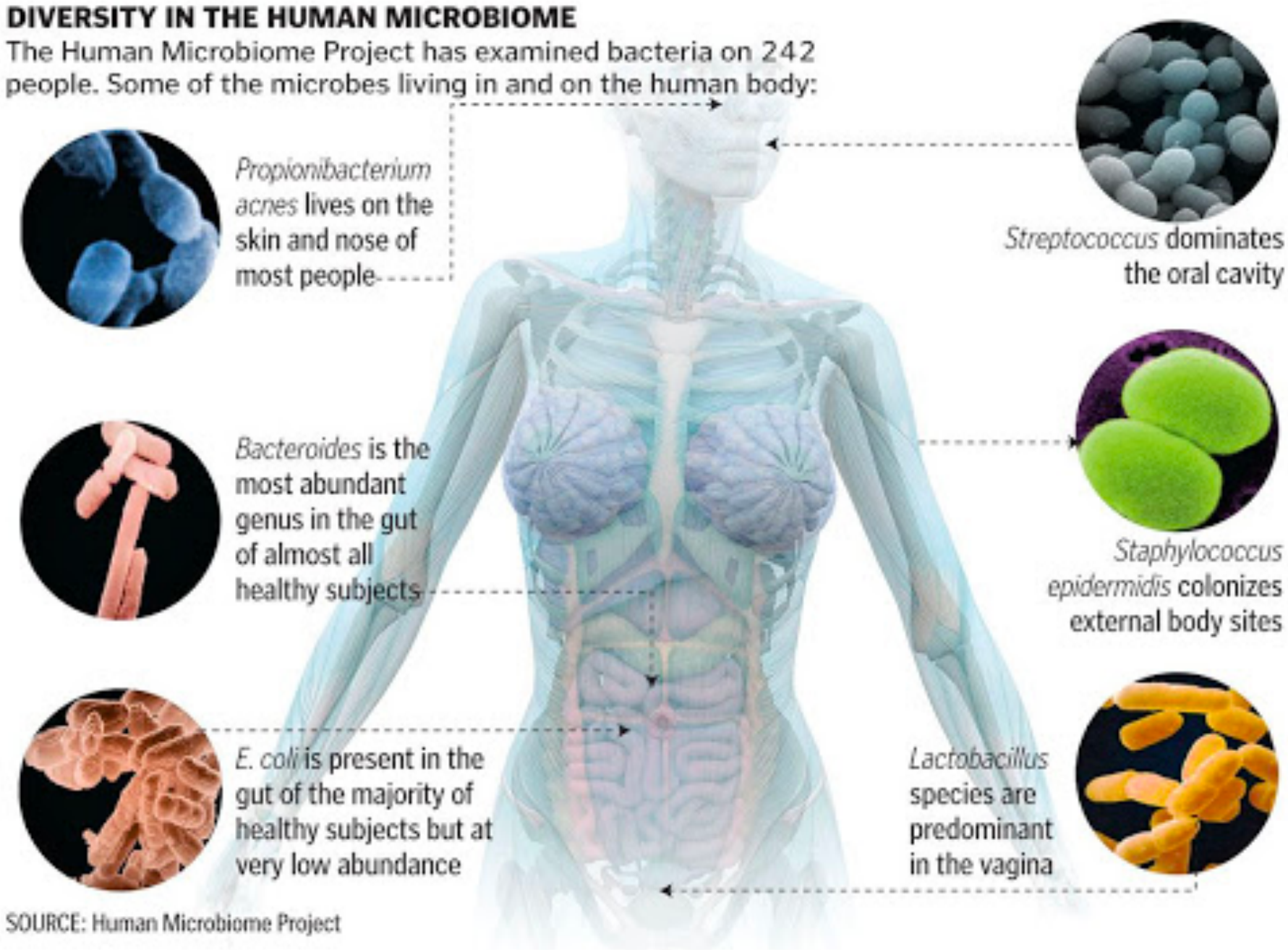


https://www.genome.gov/human-genome-project

https://science.sciencemag.org/content/sci/331/6017/546.2/F2.medium.gif




https://www.cancer.gov/about-nci/organization/ccg/research/structural-genomics/tcga/studied-cancers




https://www.bostonglobe.com/business/2013/05/11/using-bacteria-for-good-not-evil/kc9zY0Lexp1O0KoppDdY4J/story.html

DOCS HELP LOGIN

## Dataset

ncov

global

## Date Range

2019-12-07 2020-08-21

## Color By

Region

## Tree Options

Layout

RECTANGULAR

RADIAL

UNROOTED

CLOCK

Branch Length

TIME DIVERGENCE

Show confidence intervals

Branch Labels

clade

Search Strains

Second Tree

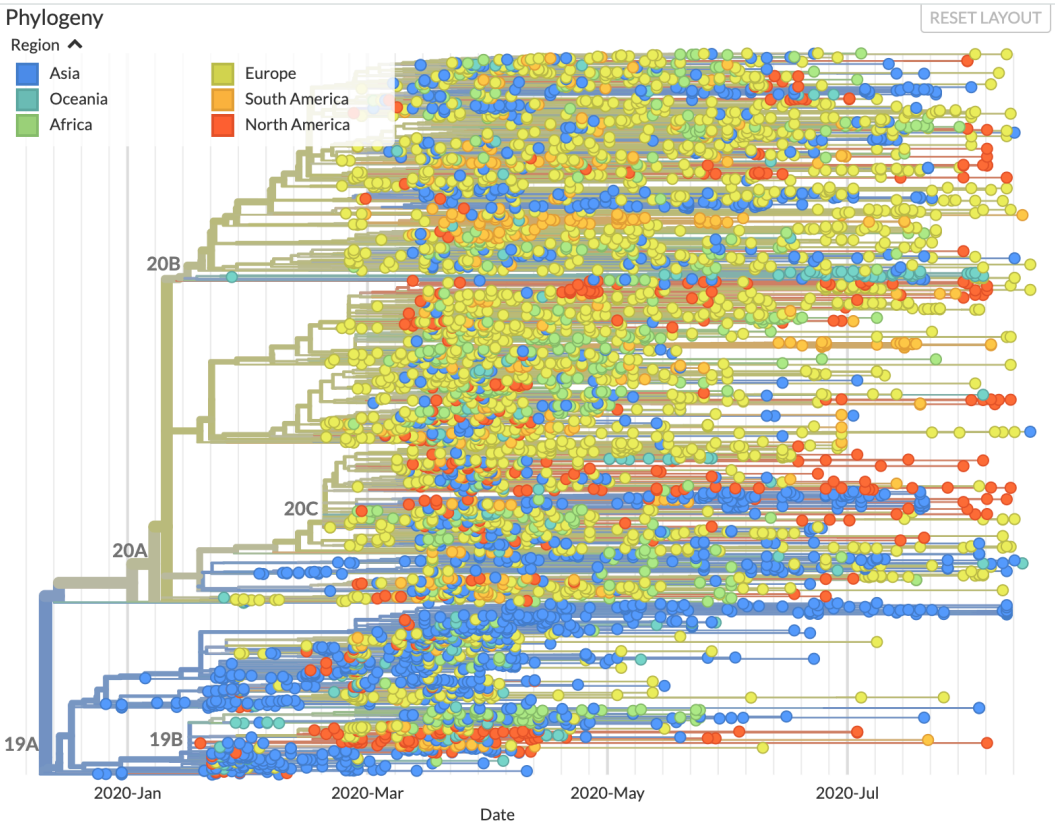
Select...

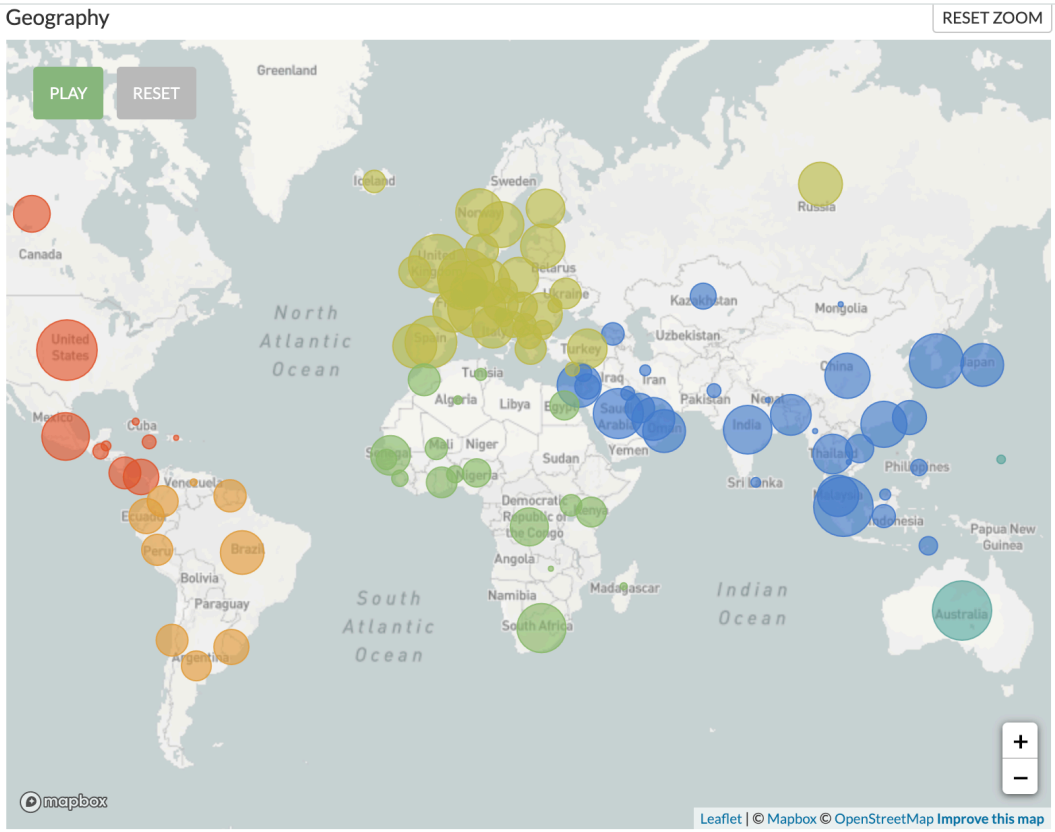
## Map Options

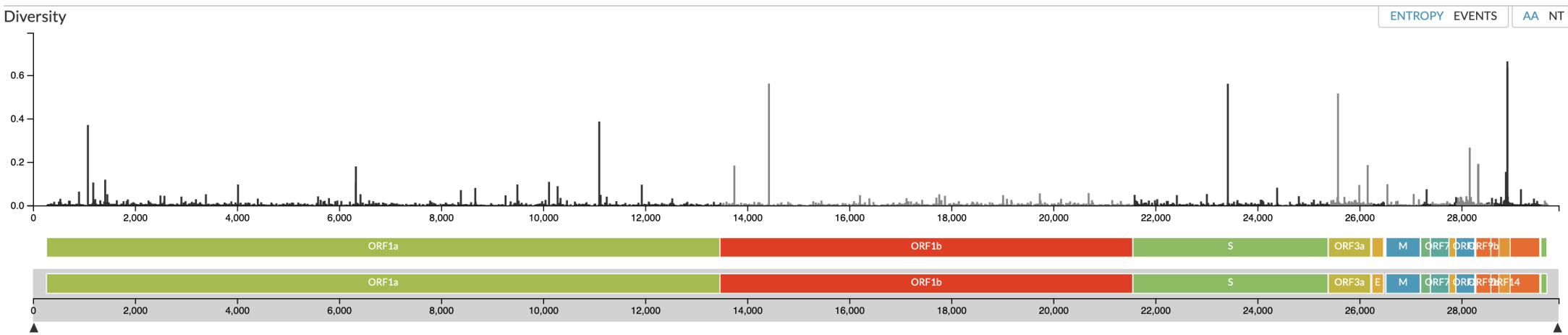
Geographic resolution

country

Show transmission lines




https://nextstrain.org/ncov/global