

What microorganisms live in Bloomington lakes/ponds? (and what do they do?)

Gene sequencing and CS/DS module

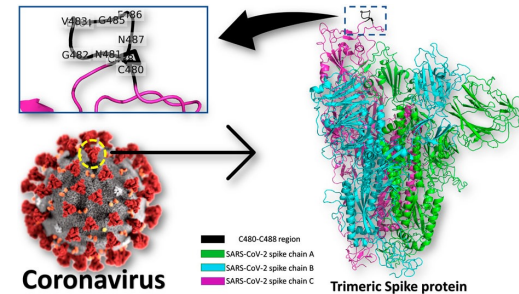
Luddy summer camp, 2021

Yuzhen Ye, Computer Science Department

DNA and DNA sequencing

SARs-Cov-2 genome

A long string of about 30 thousands of characters in the alphabet of ATCG
ATTAAAGGTTTATACCTTCC....



Viruses constantly change through mutation

SARs-Cov-2 variants:

B.1.1.7 (Alpha), B.1.351 (Beta), ..., and B.1.617.2 (Delta)

L452R (spike protein) is present in some of the variants...

21563..25384, gene encoding the spike protein

SARS-CoV-2 Data

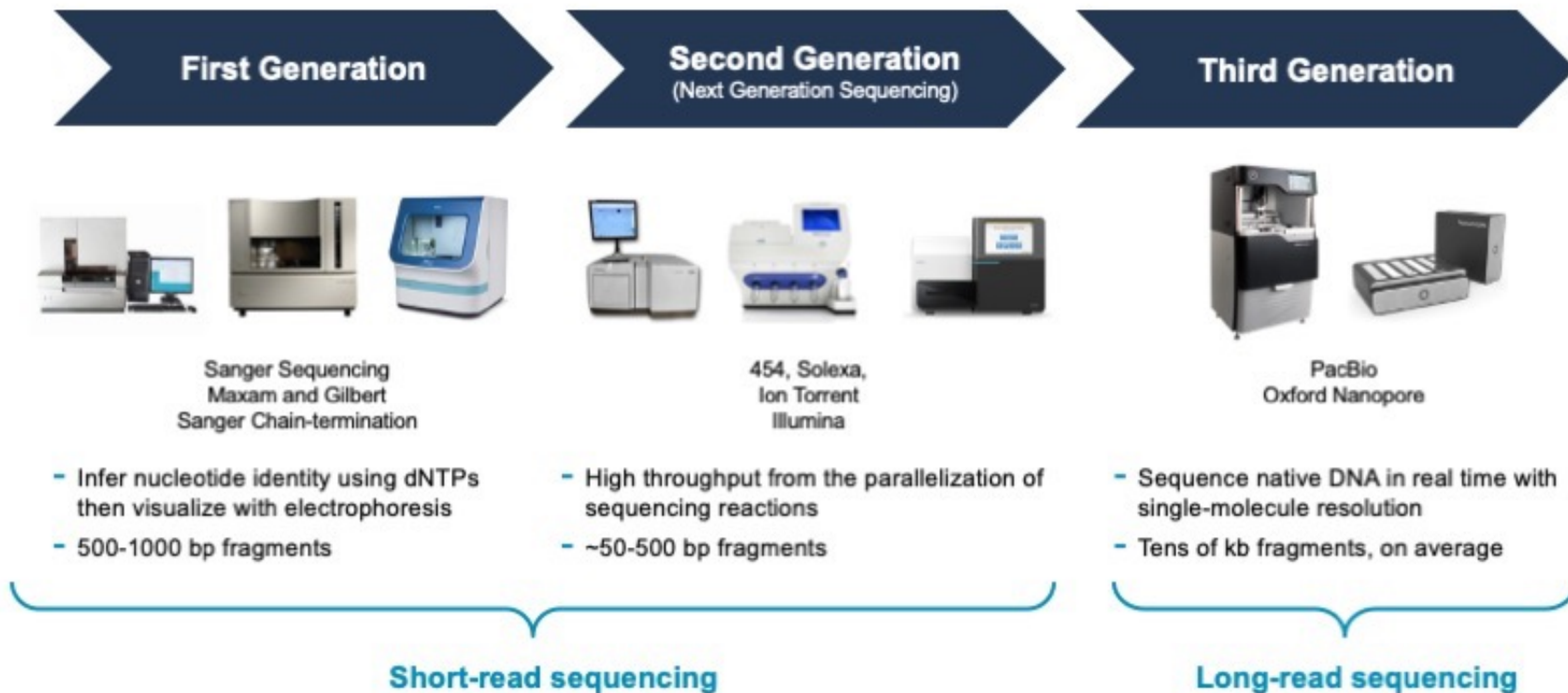
664,124
[SRA runs](#)

690,761
[Nucleotide records](#)

5,974
[ClinicalTrials.gov](#)

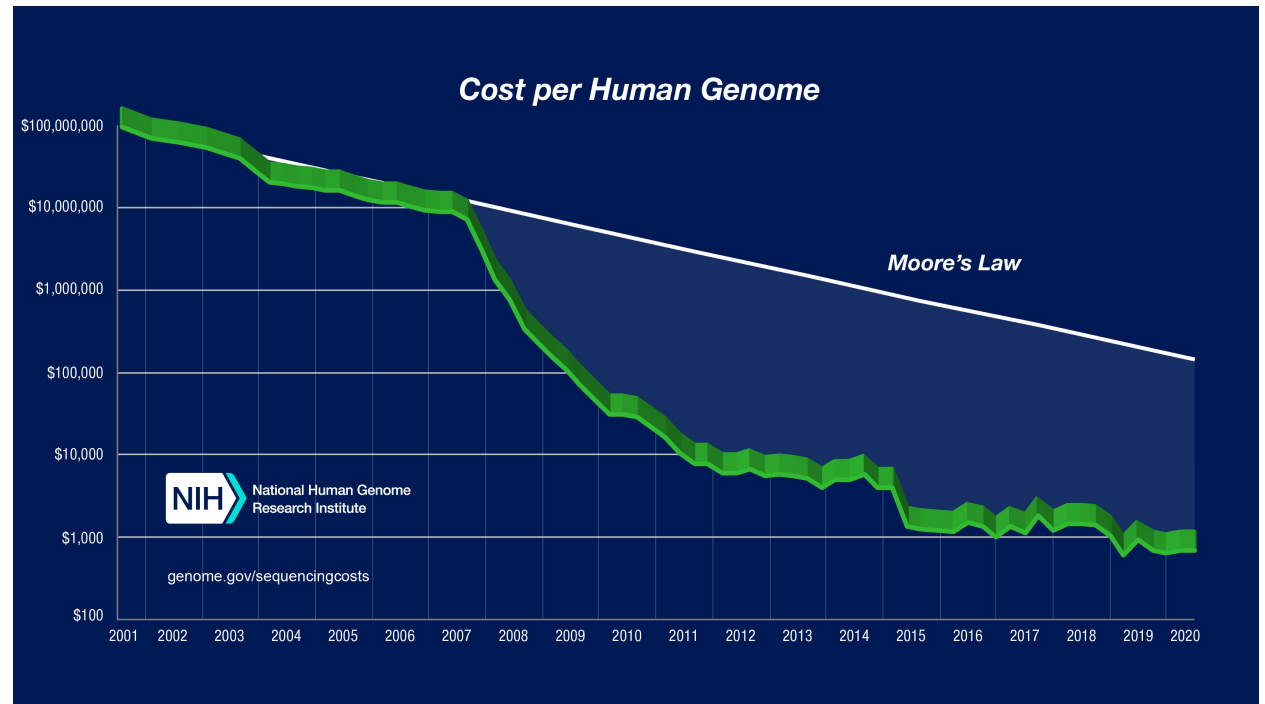
(SARS-CoV-2 is single-stranded RNA virus)

Several generations of DNA sequencers



DNA sequencing costs

Human genome: a complete set of nucleic acid sequences for humans, encoded as DNA within 23 chromosome pairs.



TTCCGGAGAGGGAGCCTGAGAAATGGCTACCACATCCACGGAGAGG

GCCTGAGAAATGGCTACCACATC

CCACATCCACGGAGAGG

TTCCGGAGAGGGAGCCTGAG

Human second genome

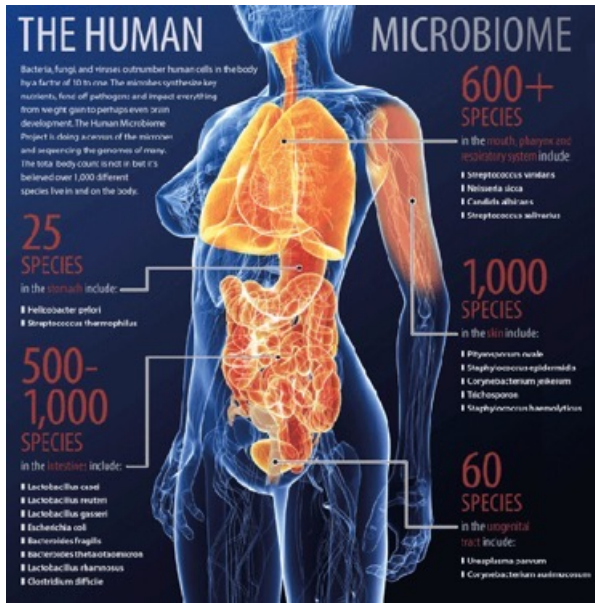


image credit: <https://i0.wp.com/allergiesandyourgut.com/wp-content/uploads/2015/06/gut-microbiome.gif>

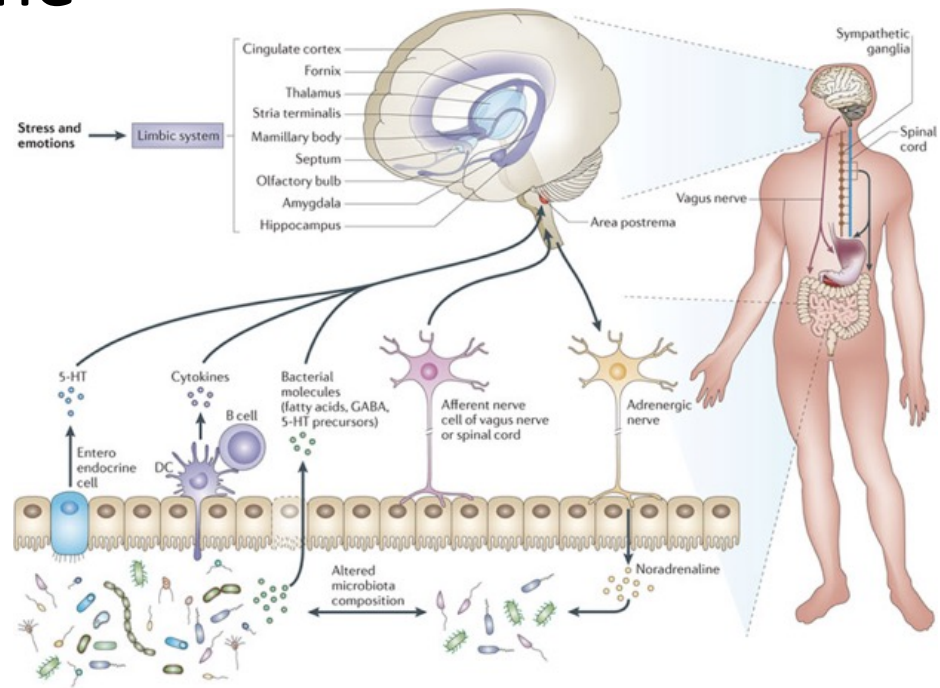


image credit: Nature Reviews Microbiology 10, 735-742

Nature Reviews | Microbiology

Microbes play many important roles in health of humans, animals, and the environment.

Microbiome: A characteristic community of different microorganisms that populate a particular environment (e.g., the human small intestine or Griffy Lake).

Human microbiome (human second genome): the set of genomes carried by the **human microbiota**.

Microbiota for diagnosis, treatment and prevention



CANCER THERAPY

Precision medicine using microbiota

Intestinal microbiota influence cancer patient responses to immunotherapy

By Christian Jobin

Accumulating evidence indicates that dysregulation of microbiota-host

the destructive potential of these cells. A series of coinhibitory molecules, called immune checkpoints, expressed by antigen presenting cells are responsible for

anti-PD-1 therapy response were bacterial diversity and abundance of *Faecalibacterium* and Bacteroidales. No such microbial correlations were observed in the oral

Our Bloomington lake/pond microbiome project -- from sample collecting to data analysis

Schedules

Monday – 2:30 overview

Monday – 3:40

Water sample collecting

Tuesday – 3:40

DNA sequencing

Thursday – 2:15

Genomic Data Analysis and Application
(Human Microbiome)

Friday – 2:00

Genomic Data Analysis and Application
(Water Microbiome)

